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Volume Nine

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OSCEOLA, *os e o' lah* (about 1804-1838), an American Indian chief, whose real name was ASSEHEHOLAR, was born near the Chattahoochee River in Georgia. His father was an English trader named William Powell; his mother, the daughter of a Creek chief. When the boy was four years old, his mother went with him to the Seminole tribes in Florida, and in early manhood he became their leader. In 1835, his wife, a half-breed daughter of a runaway negro slave, was taken into slavery by her mother's former owner, and Osceola became so wild with rage that he was kept in chains for six days by a government agent. A few weeks later, he killed the agent, and this act began the second Seminole War. On the same day, Osceola's men massacred 110 United States soldiers, and during the next two years, terrorized all of Southern Florida by repeated onslaughts from the Everglades upon unprotected settlements.

On October 21, 1837, Osceola was induced, under a flag of truce, to have a conference with General Thomas Jesup, and was seized in the midst of the conversation. Imprisonment followed, first at Saint Augustine, Fla., and later at Fort Moultrie, S. C., where he died broken-hearted, four months later. Historians generally agree that the early dealings with Osceola were anything but creditable to the whites. See INDIANS, AMERICAN (Most Important Tribes: Seminole).

ÖSEL, *ur' sel,* an island belonging to Estonia (which see).

OSHKOSH, WIS. See WISCONSIN (back of map).

OS INNOMINATUM, *os in nom ih na' tum* See SKELETON; PELVIS.

OSIRIS, *o si' ris,* in Egyptian mythology, the husband of Isis and the father of Horus. He was the chief of the gods before the introduction of the worship of Ammon, and was recognized as the father of agriculture and of civilization. Set was the god of evil, the personification of all that was opposed to man, and Osiris, as the personification of good and of beneficence, fought with him, but was defeated and killed. Isis, however, found his mutilated body and, according to some accounts, made from it Horus, who finally slew Set. Osiris lived always in the realms of the dead, and his soul inhabited the sacred bull, Apis, passing, when the bull died, to its successor.

Osiris is represented in Egyptian art in many forms—sometimes as a man with an elephant's trunk, sometimes as bearing the head of a goose or an ibis. Frequently, the horns of a bull are shown on his head. Many temples were erected for his worship, and the ruins of some of them still exist. His worship was introduced even into Rome, but the rites became so licentious that they were prohibited by law. Anubis (which see) was his assistant.

Related Subjects. The reader is referred in these volumes to the following articles

Ammon Apis Isis

OSKALOOSA, IA. See IOWA (back of map).

OSLER, SIR WILLIAM (1849-1919), a Canadian physician and surgeon, long distinguished in his profession for the breadth of his medical knowledge, but in the mind of the general public known as the author of a misquoted statement that "a man should be chloroformed at sixty." On leaving Johns Hopkins University in 1905, Osler delivered a farewell address, in the course of which he referred to the "comparative uselessness of men over forty years of age." "Take the sum of human achievement," he said, "in action, in science, in art, in literature; subtract the work of the men above forty, . . . we should practically be where we are to-day." To this he added:

> When a man nor wax nor honey can bring home, he should, in the interests of an institution, be dissolved from the hive to give more laborers room.

These remarks were freely misquoted, and gave the public an erroneous impression of Osler's capacity and ability.

Sir William was born at Bondhead, Ont., studied at the Toronto School of Medicine and McGill University, and in London, Berlin, and Vienna. From 1874, when he returned to America, until 1884, he was professor of physiology and pathology at McGill University. He then became clinical professor of medicine at the University of Pennsylvania. In 1888 he went to Johns Hopkins University as professor of the principles and practice of medicine and chief physician of the hospital; here he remained until his appointment, in 1905, as regius professor of medicine at Oxford, England. In 1911 he was created a baronet. During the World War, Sir William was appointed investigator of the medical preparedness of the British army.

Osler's Books. Among his writings are *The Principles and Practice of Medicine; The Teacher and Student; Science and Immortality; A Way of Life;*

Counsels and Ideals, and *Oliver Wendell Holmes, an Address*

OSLO, *oz' low*, known as CHRISTIANIA until renamed in 1925, is the capital and chief city of Norway, its leading port, and the center of its business interests. The city is beautifully situated on the southeastern coast at the head of Christiania Fjord, about eighty miles from the Skagerrak, an arm of the North Sea. Pine-wooded hills rise sharply behind the city, while several islands dot the fjord. The city was established in 1624, on the site of an older town, called Oslo, and national pride prompted a return to the historic name Population, about 258,000.

Oslo is the seat of government, forming a separate district, as does Washington in the United States. The town is mainly modern, brick and stone having largely superseded wood as building material The principal educational institution is the Fredericiana University, founded by Frederick VI of Denmark in 1811 The historical museum contains two viking ships, excavated in 1867 and 1880, and a third, that of Oseberg, which was later added to the collection There are sanatoriums and inns on the near-by hills, on which beautiful gardens have been landscaped. The Margaret Church, built by the Swedish colony in memory of the late crown princess of Sweden, was consecrated in 1925. Three new theaters have been erected since the World War, and various municipal improvements have been made since that time. Between 1912 and 1921, large sums were expended on equipping quays, and vessels up to 10,000 tons can now be constructed in the shipbuilding yards.

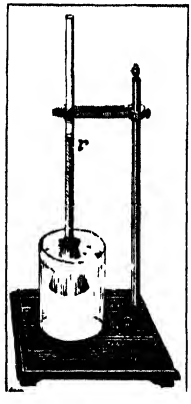
Oslo is a favorite center of the extensive tourist traffic, and regular passenger steamers serve the port from Hull, Newcastle, and London, from Bergen and the Norwegian coast cities, and from Hamburg, Amsterdam, Antwerp, etc. A movement for the electrification of the state railways from Oslo to Drammen has been initiated, and a joint arrangement for deriving power from the Glommen River has also been made between the state and the municipality, the first units being in operation in 1925. The Dovre Railway, connecting Oslo with Nidaros, was completed in 1925.

The industrial interests of the city embrace cotton and woolen mills for spinning and weaving, paper, match, and soap factories, foundries, and machine shops There is also considerable activity in the preparation of granite paving stones and in the storing of ice. The principal exports are timber, wood pulp, nails, condensed milk, butter, and hides, of which the greater portion goes to Great Britain. Of the imports, Great Britain supplies cotton and woolen yarn, machinery, and raw metals, and the United States a large proportion of the foodstuffs and about half the oils, fats, and skins. See NORWAY.

OSMAN, *ose' mahn.* See TURKEY (History).

OSMIUM, *os' mih um*, a very hard metallic element, the heaviest substance known. It is twice as heavy as lead, with a specific gravity of 22.48. Osmium occurs in platinum ores in connection with iridium (which see). The pure metal is in the form of a fine black powder or a hard blue-gray mass It is one of the hardest metals to melt, because it turns to vapor before a very high temperature is reached When heated above 200 degrees, a very irritating, suffocating vapor is given off, which may cause total or partial blindness, by spreading a film of metallic osmium over the eyeball Compounds of osmium stain the skin black. The metal is used to tip gold pen points, and is employed in making standard weights and measures Filaments made of osmium are used in some electric-light bulbs The symbol of the element is *Os* (see CHEMISTRY). T.B J.

OSMOSIS, *os mo' sis*, is the transfusion or mixture of two fluids separated by a permeable membrane such as parchment or bladder skin It may easily be demonstrated by tying a bit of parchment securely over one end of a glass tube containing a solution of sugar, and inverting the tube in a vessel of water, so that the water and the solution are at the same height. The water will pass through the membrane more rapidly than the sugar solution will pass out into the water, and this mixing will continue until there is the same solution pressure within and without the tube Sometimes, if the apparatus is large enough, so much water will push its way into the tube as to raise the level of the tube liquid twenty or thirty feet. This pressure of the water, which is often many pounds to the square inch, is called *osmotic pressure.* It is governed by the same laws as those of gas pressure; that is, it depends on the concentration and temperature of the two solutions.



OSMOSIS

In the physical experiment illustrated above, *r* represents the glass tube containing sugar in solution, referred to in the text Osmotic pressure has raised the water in the tube half the distance to the top

Applications. By the osmotic process, food and oxygen are absorbed by the blood in the human body In cookery we have examples of osmosis in the swelling of dried fruits when cooked in water, in the shriveling of fresh fruits when placed in strong

sugar solutions, and in the shrinkage of meats when packed in salt In each case there is diffusion of liquids through a porous membrane, with a more rapid diffusion of the weaker liquid For an example of osmosis in plant life, see SAP (Movements). A.L F.

OSPREY, *os' pray.* See FISH HAWK.

OSSA INNOMINATA, *os' sah in nom ih-na' tah,* plural of *os innominatum.* See PELVIS; SKELETON.

OSSICLES, *os' ih k'lz.* See EAR (The Middle Ear).

OSSINING, *os' ih ning,* N Y. See NEW YORK (back of map); SING SING.

OSSIPEE LAKE. See NEW HAMPSHIRE (Rivers and Lakes).

OSSOLI, *ohs' so le,* SARAH MARGARET FULLER, Marchioness d' (1810-1850), an American writer, born at Cambridgeport, Mass Her father, ambitious for her, forced her education, and the strain injured her health She was early noted for brilliancy, eccentricity, and violent passions After her father's death, she supported the family by teaching languages in Boston, part of the time in Bronson Alcott's private school, and by acting as principal of a private school at Providence, R I. Her sparkling and learned conversation made her conspicuous among the Transcendentalists (see TRANSCENDENTALISM), and she became the editor of their paper, *The Dial.* She occasionally visited Brook Farm, but, like Emerson, realized that the experiment was sure to fail, and did not identify herself with it

About 1840 she published some translations from the German, and soon after brought out her first original volume, *Summer on the Lakes,* describing a trip to Lake Superior The most productive part of her literary life was in the years 1844-1846, during which she lived in New York and wrote brilliant essays on art and literature for the *Tribune* She also wrote *Woman in the Nineteenth Century.* In 1846 she went to Europe, and while living in Rome, married the Marquis d'Ossoli During the Italian revolution of 1848, she served in the Roman hospitals, and when the city fell before the French, she fled with her husband and infant son to the mountains, thence to Florence, and a little later sailed for America On July 16, 1850, the entire family was drowned in a storm off Fire Island Beach, near New York, and with her was lost the manuscript of her history of the Italian revolution.

OSTEND, *ost end'.* See BELGIUM (The Cities).

OSTEND MANIFESTO, a dispatch signed at Ostend, Belgium, October 9, 1854, by James Buchanan, John Y. Mason, and Pierre Soulé, at that time United States ministers to Great Britain, France, and Spain, respectively. The Manifesto declared that if Spain would not sell Cuba, the United States would acquire it by force and prevent its being Africanized, like Haiti. These ministers met at the suggestion of President Pierce. Nothing came of the Manifesto, as it was condemned by all political parties in the United States. See CUBA (History); PIERCE, FRANKLIN (Administration).

OSTEOPATHY, *os te op' ah thie,* the first system of treatment of disease by adjustment. The founder was Dr. Andrew Taylor Still. He believed that the body makes all necessary remedies for diseases, and that the blood carries them to where they are needed. He believed, also, that bones, muscles, ligaments, and other parts of the body machine get out of adjustment and interfere with the transmission of nerve impulses and the flow of blood and lymph. Osteopathy teaches that health depends upon many things—mental conditions, environment, diet, hygiene, sanitation—but fundamentally upon the flexibility and normal movements of the body machine, especially the joints of the spine and ribs. Osteopathy includes obstetrics and surgery.

After announcing osteopathy, in 1874, Dr Still practiced for eighteen years before organizing a college at Kirksville, Mo., in 1892 There are six colleges now recognized by the American Osteopathic Association, about seventy hospitals and sanitariums, and many clinics The minimum educational requirement is high-school graduation, followed by four standard college years in osteopathy.

The first law regulating osteopathy was passed in Vermont in 1896. There are now such laws in all of the states and in most of the provinces of Canada. R.C.H

OSTRACISM, *os' tra siz'm* In the days of ancient Athens, it was customary to banish citizens for political offenses Whether or not a person should be exiled was determined by a general balloting of the voters, the votes being cast by means of earthenware tablets or oyster shells, on which the name of the culprit was written. The Greek name for these ballots, *ostrakon,* gives us the name ostracism. This was not always a punishment for known offenses, but was sometimes employed as a precaution taken to preserve peace. Banishment usually lasted about ten years, after which the citizen might return to his estate Themistocles, Cimon, and Aristides all suffered ostracism at some period (see the biography of each Athenian in these volumes).

Aristides, called "the Just," a statesman and general, in 488 B.C. opposed Themistocles' naval policy, being ardently in favor of keeping Athens a land power. He was ostracized in 483 B.C., or thereabouts, but returned from exile in 480 to aid the Athenians against the Persians. At the time of his banishment, a man of the people, wishing to vote for the statesman's exile, asked Aristides himself for help in writing "Aristides" on his tablet.



ON AN OSTRICH FARM IN CALIFORNIA

"Why," said the general, "has he ever wronged you?" "No," replied the man, "but I am tired of always hearing him called *the Just.*" See illustration of the incident, page 381.

In modern usage, we speak of ostracizing persons for social or moral reasons. This expression means that such persons are ignored, snubbed, or banished from respectable circles.

OSTRACODERM, *os' trah ko durm.* See GEOLOGY (The Story by Eras).

OSTRICH. This largest of living birds, with its elevated back, padded toes, extremely small head and long neck, is such a curious-looking member of the winged family that it is easy to understand why the ancients should have called it the *camel bird.* Not only is the camel suggested by its appearance and peculiar humping gait, but by its power of going for a long time without water—a faculty very necessary to its existence, in view of the fact that the persecutions of hunters have driven it for the most part to the dry plains and sandy deserts.

The ostrich is a native of Africa and Asia, and in former times, great flocks grazed over both continents practically undisturbed, except when the Arabs chased them for sport, or African natives stole the eggs for eating, or killed a few birds for feathers with which to adorn their dusky bodies. Ostriches have never been killed for food, as the flesh is coarse and unsavory. Ever since the ostrich plume became a valuable article of commerce, however, the bird has been hunted with such persistence, and exported in such numbers to stock ostrich farms in other places, that it is now practically extinct in its native haunts, save in the less accessible regions.

Physical Characteristics. A full-grown ostrich stands seven to eight feet high and weighs between 200 and 300 pounds. Only the recently extinct moa, of New Zealand, exceeded the ostrich in height. This bird was over twelve feet tall. Unlike other birds, the ostrich has only two toes—the third and the fourth. The South American rhea, called the American ostrich, is distinguished from the true African variety by the possession of an additional toe (see RHEA). The ostrich and the rhea are placed in the order *Ratitae,* along with two Australian birds, the emu and the cassowary (both of which see). The eyes of the ostrich are very large and the neck about three feet in length, giving the bird a range of vision which enables it to detect danger at a distance of several miles. So powerful are its long, thick legs that the kick of an ostrich, usually directed forward, can disable and even kill horses as well as men. Both legs and thighs are perfectly bare of feathers, and the head and neck are covered only with a sparse growth of down; it is the body, with the beautiful fluffy plumage, that has been the source of the

bird's commercial value. The female is modest in an unassuming dress of dull gray and white or brownish-gray feathers, but the male is a most handsome creature, with a glossy black body and wing and tail plumes pure white in color. His voice does not match his costume in beauty, however, for it is like a deep-toned roar, similar to that of a lion or ox, with a peculiar hissing quality; it adds greatly to the comfort of those near him that he is far from being a talkative bird.

Its Remarkable Swiftness. In his essay on Dryden, Macaulay wrote, "His imagination resembled the wings of an ostrich, it enabled him to run, though not to soar." The short wings of the ostrich, with their beautiful plumes, are quite useless for flight, but they help lift its weight from the ground; and the momentum thus gained combines with the running power of its sturdy legs to give it the amazing stride of twenty-five feet when in full run. It can cover sixty miles an hour, outstripping the fleetest Arabian horse. On the ostrich farms of the Pacific coast, races are frequently held between trained ostriches, and these are said to be far more exciting than horse races Visitors are also entertained by the spectacle of some employee of the ranch riding "ostrich back" and being carried past as though on the wings of the wind.

The ostrich is unusually wary as well as speedy, but the weakness which makes it a victim of hunters is a lack of self-possession and good sense, which causes it, when pursued, to run in a circle. Thus, while a single horseman cannot overtake it, a number are able, by surrounding and closing in upon their prey, to capture it with a lasso, or kill it with spear, rifle, or arrow. The old belief that an ostrich hides its head in the sand when threatened with danger is only a fable.



Photo: Wide World

A RACING OSTRICH

An ostrich race is said to be more exciting and more amusing than a horse race.

Its Family Life. The wild ostrich is a polygamist, with from two to seven hens, and he is also a sociable creature, traveling about the country with other families in small groups or large flocks. Each female deposits about ten eggs in a common circular hollow which the head of the family has scooped out of the ground with his toes. The eggs weigh about three pounds each—equivalent to two or three dozen of our breakfast eggs—and have shells so thick and strong that they serve the African natives as bowls and cups. Some of the eggs in the nest are intended as food for the young chicks, and many of the others are broken before the hatching; so that a brood is seldom larger than thirty chicks. Natives are very fond of eating ostrich eggs, but they are difficult to steal because the old birds are such vicious and powerful fighters.

The male assumes full responsibility for the hatching and safe-keeping of the eggs, sitting upon the nest at night with the hens grouped about him. In hot climates, he covers it with sand in the daytime, depending upon the heat of the sun to keep it warm, but remaining close by to guard it. In this duty, he is relieved from time to time by the hens. Lacking the hot sun and sand of African deserts, the domesticated birds brood upon the eggs all day, as well as during the night. In from six to seven weeks, the young ostriches emerge, already as large as one of our ordinary barnyard hens, and with good appetites. If their hunger is abundantly satisfied, they mature so quickly that by the end of six months they have attained full growth Wild ostriches subsist on grass, leaves, seeds, and fruit, small birds, and insects, with water whenever it can be procured, while those in captivity are fed mostly upon alfalfa and grain. The ostrich swallows any sort of hard, gritty material that comes in its path, such as stones, glass, bones, and the like. These are used as other birds use gravel, to assist in the work of digestion

Ostrich Farming. The ostrich has been reared in captivity for many years in Cape Colony, Algeria, and Argentina, for a number of years in Arizona and Southern California, and more recently in Arkansas, Texas, Florida, and Pennsylvania. Though the birds usually keep healthy and are rapid breeders, they are such voracious eaters that they prove an unprofitable investment when changes of fashion or interference with commerce affects the market for plumes. Birds that originally were valued at $150 could be purchased for $5 after the outbreak of the World War. Ostrich feathers are no longer in demand for millinery; more than 200,000 ostriches in South Africa, in consequence, have been killed.

The plumes are taken from the bird about every seven months, but they are cut off, not



Photo U & U

ON GUARD

The male bird is circling the nest, to protect it from intruders, while his mates are absent It is seldom that such a picture can be secured

pulled out, as many people suppose The stumps of the severed feathers are taken out a few days later, or fall out of their own accord, and new ones grow in their place As the ostrich may live for eighty years, it will be seen that ostrich farming is a lucrative occupation when there is a demand for plumes D L

Scientific Name. Ostriches constitute the genus *Struthio* of the family *Struthionidae* The common African ostrich is *S camelus*.

OSTROGOTHS (Goths of the East). See GOTHS

OSTROVSKY, *ahs trof' ske*, ALEXANDER See RUSSIAN LITERATURE.



THE BABY OSTRICH IS NOT A SOFT AND DOWNY BIRD

Its body, mottled and brown, is covered with little stiff feathers An ostrich egg weighs from three to four pounds, equal to about thirty hen's eggs, and about forty-two days are required to hatch The nest of the ostrich is a hole in the sand

OSWEGO, N Y. See NEW YORK (back of map)

OSWEGO TEA. See BALM

OTHELLO, *o-thel' o* See SHAKESPEARE, WILLIAM (Synopses of the Plays)

OTHMAN. See TURKEY (History)

OTHO, *o' tho*, the name of three successive rulers of the Holy Roman Empire, father, son, and grandson Their supremacy continued from 936 to 1002 Otho I, called also OTHO THE GREAT, founded the Holy Roman Empire (which see)

Otho I, the Great (912-973), succeeded his father, Henry I, as king of Germany, in 936 He was at once forced to resort

to arms to defend his rights at home and abroad. The great nobles, putting forward Otho's brother Henry as their candidate for the crown, began a civil war, but before Otho could turn his attention to them, he was forced to contend against the Slavs and Hungarians to the east and south, who were attempting to assert their independence Successful in this undertaking, he defeated the turbulent vassals, taking from many of them their fiefs These he bestowed upon friends and relatives on whose fidelity he could depend

In 951 Otho was summoned into Italy by Adelaide, queen of Lombardy, who sought his aid against Berengar, a claimant to the throne and to her hand By defeating Berengar and marrying Adelaide, Otho established himself strongly in Northern Italy On his return to Germany, he had to meet an invasion of the Magyars, whom he decisively defeated in 955 Again, in 961, he went to Italy to settle disturbances caused by Berengar, and in the next year, at Rome, was crowned by Pope John XII as Holy Roman Emperor

The connection between Germany and Italy thus formed had a most unfortunate effect upon the history of the former nation in the centuries which followed Later, Otho deposed the Pope who had crowned him, and had his candidate placed in the Papal chair as Leo VIII, thus asserting the superiority of the emperor over affairs of the Church

Otho II (955-983), the second Holy Roman Emperor, was the son of Otho I He was crowned during his father's lifetime, and came to the imperial throne in 973 without resistance Within a few years, however, the young emperor was called upon to meet several formidable enemies, and defeated successively Henry, Duke of Bavaria, the king of Bohemia, and Lothair, king of France, who had taken possession of Lorraine Later, insurrections at Rome and at Milan led the emperor to cross into Italy, and he was successful in establishing his power in Apulia and Calabria The Greek emperor, however, summoned to his aid the Saracens, and at Cotrone, in 982, Otho was severely defeated While he was making plans for a campaign against the Saracens, he died at Rome

Otho III (980-1002), third Holy Roman Emperor, was the son of Otho II and grandson of Otho I At the death of his father, he was crowned king of the Germans, though but three years old at the time His mother and grandmother acted as regents until 996, when Otho received the imperial crown from Pope Gregory V and began to rule in his own right In 998 he was called to Italy to put down a disturbance caused by Crescentius, a Roman noble, and was completely successful He placed his tutor, Gerbert, in the Papal chair as Sylvester II, and began to form plans for reviving the glories of the Western Empire and making Rome again the great capital which it had once been The Romans, however, rose against him, and he was forced to flee to Ravenna, where he died

OTHO, MARCUS SALVIUS (32-69), one of three Roman emperors whose short reigns succeeded that of Nero, and who were raised to power by the soldiers. Otho had been a favorite at Nero's court. He secured the throne for himself by murdering his predecessor, Galba, an old man of seventy-three years. His accession was not recognized by the German armies, who proclaimed their general, Vitellius, emperor. Vitellius led an army to Italy and defeated the Roman forces, whereupon Otho stabbed himself See GALBA.

OTIS, ELWELL STEPHEN (1838-1909), an American soldier who rose to the rank of major general. He was born in Maryland In 1862 he joined the Union army as captain, and achieved in that service the rank of brigadier general. In 1898 he was sent to the Philippines, and after peace was restored was a member of the Philippines Commission. He was made a major general in 1898

OTIS, JAMES (1725-1783), a patriotic leader in the American Revolution, whose eloquent speech against the issuance of Writs of Assistance, delivered in 1761, won him lasting fame Of this speech John Adams said, "American independence was then and there born" Otis was born at West Barnstable, Mass., was graduated at Harvard College in 1743, studied law, was admitted to the bar in 1748, and became advocate-general of Massachusetts His high character and ability were demonstrated when the attempts of the colonists to evade the navigation laws caused the surveyor-general, Thomas Lechmere, to apply to the superior courts for writs of assistance, used in searching for smuggled goods Otis resigned his office to become counsel for the opposition. Though the writs were not declared illegal, they were no longer enforced (see WRIT OF ASSISTANCE)

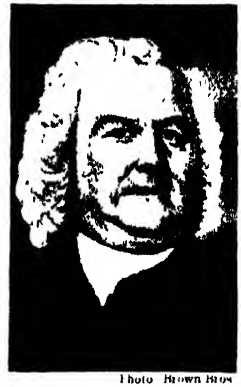
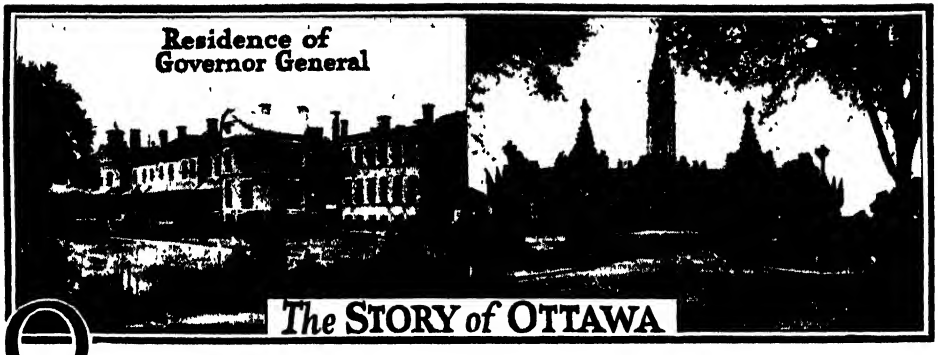


Photo Brown Bros

JAMES OTIS

From that time, Otis was increasingly active in the Revolutionary agitation In 1765 he was on the Massachusetts committee which recommended the Stamp Act Congress (see STAMP ACT) As a delegate to the Congress, he assisted in preparing the address to the British House of Commons. In 1769 he published a violent attack on the commissioners of customs, and as a result, he became involved in a quarrel with one of the commissioners, in the course of which he received a wound in the head. Much of his later life was spent in retirement, as his mind became unbalanced, probably as the result of the wound. History records, however, that he took part in the Battle of Bunker Hill, having escaped the vigilance of his caretakers. He was killed by lightning at Andover, in 1783.

OTTAWA, ILL. See ILLINOIS (back of map).



The STORY of OTTAWA

OTTAWA, ONT., the capital of the Dominion of Canada, lies in the southeastern part of the province of Ontario, on hills rising above the southern bank of the Ottawa River, about 120 miles from where that stream empties into the Saint Lawrence, at Montreal. The city is joined by four bridges with Hull, a French-speaking city situated in the neighboring province of Quebec, on the opposite side of the river. It is connected with Kingston, Ont., by the Rideau Canal.

Just above the city the Ottawa rushes over a picturesque cataract known as Chaudière Falls, whose name is the French word for *boiler*. Below the city are the Rideau Falls, where the Rideau River, divided into two channels by Green Island, rushes into the Ottawa. Three centuries ago, Samuel de Champlain, the first white man to see these falls, called them "marvelous," for the river, he said, "descends a height of twenty or twenty-five fathoms with such impetuosity that it makes an arch nearly 400 paces broad." Amid such lovely surroundings, Ottawa has grown from a few huts to a city ranking third in the province and sixth in the Dominion in size. Its natural loveliness has been preserved, while splendid parks, wide avenues, and imposing buildings have been added. Population, 1921, 107,843.

General Description. The city is divided by the Rideau Canal into two parts, the Upper Town, or western part, is predominantly English, and the Lower Town, or eastern part, is almost entirely French. A notable exception to this division of nationalities is the Sandy Hill district, which is east of the canal but is one of the most fashionable English-speaking sections of the city. The Lower Town, though interesting to many English-speaking visitors, has little of the old-world charm which makes Quebec so fascinating to tourists. The Upper Town, on the contrary, is far from commonplace, and has most of the prominent public buildings and fine residence sections.

Conspicuous among the chief architectural features of the city are the Parliament Buildings, which stand on the summit of the highest hill overlooking the river The structures cover nearly four acres, and form three sides of a quadrangle They are in a modified Italian Gothic style, and are built of native sandstone. The central building, containing the halls of Parliament, is 470 feet long, and the main tower, which crowns the edifice, is 180 feet high. It contains a War Memorial chamber Adjoining the main building on the rear is the Parliamentary library, a beautiful octagonal structure The corner stone of these great buildings was laid in 1860 by King Edward VII, then Prince of Wales. In February, 1915, fire seriously damaged the central building, and for a few hours threatened to destroy the entire group. It was finally brought under control, and the work of reconstruction began almost immediately. The restored central building has double the height of the old one (see illustration under CANADA, DOMINION OF)

A short distance from the Parliament Buildings is the Château Laurier, a magnificent hotel in the style of a French château, owned by the Grand Trunk branch of the Canadian National Railways. Seen from a distance, the Château Laurier looks almost like one of the group of buildings on Parliament Hill. Directly across the street from the hotel, on the east bank of the Rideau Canal, is the Grand Trunk Union Station, completed in 1912. Among other noteworthy buildings are the Roman Catholic Cathedral of Notre Dame, Christ Church Cathedral, Langevin Block (occupied by the postoffice department), the Royal Mint, Royal Observatory, Dominion Archives building, Victoria Museum, National Art Gallery, and Carnegie Library. Rideau Hall, the residence of the Governor-General, is just outside the city, and in the vicinity is the Central Canadian Experimental Farm.

Ottawa has a number of attractive parks, covering over 2,000 acres and connected by fine boulevards. Parliament Hill, which has been landscaped as a park, contains statues of Sir John A. Macdonald, Alexander Mackenzie, Sir Georges E. Cartier, and others Strathcona



A GLIMPSE OF THE CITY OF OTTAWA
The imposing building at the right is the Château Laurier, at the extreme right is the Central Station, in the extreme upper left are the Parliament buildings, at the central left is the postoffice

Park, on the Rideau Canal, one of the newer city pleasure grounds, was formerly a useless bit of swamp land Major's Hill Park, east of the canal, is especially attractive Ottawa is the headquarters of the Royal Canadian Mounted Police and of the Air Force The Canadian War Memorial, an arch forty-five feet high, was erected in 1926.

Education. Ottawa has excellent public schools, a collegiate institute, a normal school, several private schools, and the University of Ottawa, a Roman Catholic institution founded in 1849 by the Oblate Fathers of Mary Immaculate. It was originally called College of Bytown, but received its present title in 1866. In 1899 Pope Leo XIII raised it to the rank of a university French-speaking students are far in the majority.

Transportation. Ottawa's early growth was due to water traffic. The city grew up at the northern end of the Rideau Canal, on which there is considerable local traffic, and steamers ply on the river between Ottawa and Montreal But the railways have taken much of the traffic which formerly went by water. As the city developed, it enjoyed the service of three great trunk lines—the Canadian Pacific, Canadian Northern, and Grand Trunk—and one shorter line, the Ottawa & New York. The Canadian Northern and Grand Trunk were later absorbed by the Canadian National system The Canadian Pacific has lines on both banks of the river to Montreal. By the shortest rail route, Ottawa is 101 miles west of Montreal and 217 miles northeast of Toronto.

Industry. The many attractions of Ottawa do not overshadow the fact that it is one of the chief manufacturing cities of the Dominion. Together with Hull, this section comprises one of the largest lumbering centers in the Dominion, the lumber being floated down the Ottawa and its tributaries. The Chaudière Falls provide ample hydroelectric power for the more than 450 industrial plants. Wood products are the most important goods manufactured In Ottawa is located one of the largest lumber factories in the entire British Empire.

History. The site of Ottawa was first visited by white men in 1613, when Champlain's party ascended the river. Thereafter, for two centuries, the Chaudière Falls portage lay on the main route from the Saint Lawrence to the far country in the West. In 1800 one Philemon Wright, a native of Massachusetts, built a hut on the north bank of the Ottawa River, where Hull now stands, but it was not until 1827 that a settlement of any size was made on the south bank. It was named Bytown, in honor of Colonel John By (1781-1833), a British army officer who superintended the construction of the Rideau Canal.

Outline and Questions on Ottawa

I. Location and Size

(1) On Ottawa River
(2) Population
(3) Reasons for growth
  (a) Water traffic
  (b) Choice as capital

II. Description

(1) Picturesque situation
(2) Division into two parts
  (a) English-speaking
  (b) French-speaking
(3) Buildings
(4) Parks
(5) Experimental farm
(6) Educational institutions
(7) Social life

III. Industrial Life

(1) Water power
(2) Chief products

IV. History

(1) Early explorers
(2) Settlement
(3) Choice as capital
(4) Growth

Questions

Why was Montreal deprived of the honor of being the capital of Canada?

Why was the selection of Ottawa as the capital a wise one?

How could you tell, if you walked along the streets and listened to the conversation of the passers-by, whether you were in the Upper Town or the Lower Town?

Describe the natural beauties of the site of Ottawa

To what was the early growth of the city due? Why is this factor no longer of prime importance?

Of what architectural style are the Parliament Buildings typical?

Who was the first white man that visited this site? What impression did it make on him?

What was the first name of the town? Why was it given and when was it changed?

How many cities of the Dominion are larger than Ottawa?

What park is named for one of Canada's great statesmen? What statesmen are commemorated by statues in another park?

In 1854 Bytown was incorporated as a city, and its name changed to Ottawa. Four years later, it was selected by Queen Victoria as the capital of Canada Montreal had been the capital until 1849, but had then forfeited its right to be the seat of government by the riots following the passage of the Rebellion Losses Bill The other rivals, Toronto, Kingston, and Quebec, were near the border and exposed to possible attack The first Parliament to meet in Ottawa sat in 1865, and thereafter the city's growth was rapid.

In July, 1927, Ottawa was the center of a great Canadian celebration commemorating the sixtieth anniversary of the union of the British colonies in America The festival had been postponed for ten years because of the World War See CANADA (History)

OTTAWA INDIANS. See INDIANS, AMERICAN (Most Important Tribes).

OTTAWA-RIDEAU, *re doh'*, **CANAL.** See CANADA (Transportation).

OTTAWA RIVER, the chief tributary of the Saint Lawrence River, and itself one of the most important waterways in Canada It rises on the eastern slope of the Laurentian Highlands, at a point about 160 miles north of the city of Ottawa, and pursues a general easterly course to the Saint Lawrence It has two mouths, between which lies the island of Montreal, on which is the great city of the same name For about one-half of its 685-mile course, the Ottawa forms the boundary between the provinces of Ontario and Quebec Ottawa, in Ontario, and Hull, in Quebec, are on opposite sides of this river.

The lumber trade on the Ottawa and its numerous affluents is probably the largest in the world Navigation is impeded by occasional rapids and falls, the largest of these are the Chaudière Falls, above the city of Ottawa. Dams and slides facilitate the work of the lumberman, but do not permit navigation by boats of large size The Rideau Canal system connects the Ottawa with the Saint Lawrence and Lake Ontario, at Kingston, and the Georgian Bay Ship Canal (see GEORGIAN BAY) will probably follow the course of the Ottawa from Mattawa to its eastern terminus at Montreal.

OTTAWA UNIVERSITY. See KANSAS (Education).

OTTER, *ot' ur*, the name of a group of fur-bearing animals distinguished by their adaptation to life in the water. The otters form a subfamily within the weasel family of flesh-eating mammals (see CARNIVOROUS ANIMALS) They are found in all continents except Australasia, and are divided into two groups, the *river otters* and *sea otters*. The river otter has a thick, flexible body and long, tapering tail, a large, flattish head, strong, sharp teeth, large nostrils, small ears and eyes, short, stout



THE OTTER CAPTURES HIS DINNER

legs with webbed toes, and sharp, curved claws. It is about three and a half feet in total length.

The fur, like that of the beaver, is of two kinds. The underfur is short, soft, and whitish-gray, and is covered by long, stiffer hairs of a rich-brown color. These otters are rapid swimmers, and they dive expertly after their principal food of fish They are very playful, and on land they delight in tobogganing down muddy slopes or icy hills. Common river otters make their homes in burrows in banks of streams or in caves above ground. Between February and April, two to five baby otters are born The fur is used chiefly for coat linings, collars, cuffs, and gloves After the outer long hairs are removed, the fur is often dyed a seal color and sold as a substitute for that fur. See FUR AND FUR TRADE.

Sea otters, found only on North Pacific coasts, are becoming rare. They very much resemble seals. Unlike river otters, they do not eat fish, but live on clams, crabs, and mussels Their tails are short,. and their fur, which is soft and of a deep liver-brown, is very valuable. People of Russia and China esteem it highly, and in the latter country, it was used to trim the state robes of the mandarins in the days of the empire.

Sea otters are very shy and cautious. They are captured by spearing, shooting, clubbing, and netting This species bears but one offspring at a time, and at any season of the year. Chinese fishermen have taught otters to help them in their task of fishing, just as they have the cormorant (which see). An Indian species is also trained to this work by natives of Bengal. M.J.H.

Scientific Names. Otters constitute the subfamily *Lutrinae* of the family *Mustelidae*. The common river otter of Alaska, Canada, and the United States is known as *Lutra canadensis*

OTTER CREEK. See VERMONT (Rivers and Lakes)

OTTO I (1815-1867), the first king of Greece after its liberation from Turkey. When, in 1830, Greece was recognized as an independent state, the Great Powers offered the crown to Prince Leopold of Belgium. Leopold, accepting at first, later declined the honor, and in 1832 the Conference of London suggested Otto, the second son of Louis I of Bavaria, as king of Greece. The National Assembly concurred in the choice, and the new king bade fair to be popular. For three years a regency governed, but in 1835 Otto took matters into his own hands, and it became apparent almost at once that his reign would not please the people Taxes were heavy, the king's Bavarian counselors were hated, and the queen, Amalie of Oldenburg, who was disliked by her subjects, was charged with assuming too large a share in the government.

In 1843 a revolutionary outbreak compelled Otto to grant a Constitution and to appoint Greek Ministers, but the difficulties increased rather than lessened, and the wavering policy of the government during the Crimean War incensed the people, who wished to interfere on the side of the Russians In 1862 a military rising compelled Otto to flee the country, and in 1863 the National Assembly elected as their king the second son of Christian IX of Denmark (see GEORGE I). See, also, GREECE (History).

OTTOMAN EMPIRE, a name applied to the former Turkish Empire. See TURKEY.

OTTUMWA, IA. See IOWA (back of map).

OUACHITA, *wahsh' ih taw,* **RIVER,** a stream about 545 miles in length, which rises

in Western Arkansas, flows east and then south into Louisiana, and joins the Red River about fifteen miles above the Mississippi. It is navigable for about 350 miles, as far as Camden, Ark., the year round. Smaller boats, and large boats for eight months of the year, can ascend seventy miles farther, to Arkadelphia. The stream is sometimes called the Washita. See LOUISIANA (Rivers).

OUDENARDE, *ü deh nahr' deh,* BATTLE OF See SUCCESSION WARS (War of the Spanish Succession).

OUIDA, *we' dah.* See RAMÉE, LOUISE DE LA

OUISTITI, *wis' tē tē.* See MARMOSET.

OUNCE, *ouns,* a measure of weight and of volume. In troy weight, the ounce is equal to one-twelfth of a pound, or 480 grains, in avoirdupois weight, it is equal to one-sixteenth of a pound, or 437½ grains. Grains are the same in all systems of weights and measures. The troy ounce is used in weighing precious metals, and is equal to the apothecaries' ounce, employed in compounding prescriptions of dry medicines and drugs The avoirdupois ounce is a unit employed in weighing ordinary merchandise, such as foodstuffs.

In compounding liquid medicines, the American pharmacist uses an ounce equal to eight fluid drams, by volume. There are sixteen fluid ounces to a liquid pint, which has a volume of 28 875 cubic inches. Canada uses a fluid ounce based on the Imperial gallon, this ounce is one-twentieth of a pint equal to 34.65923 cubic inches See DENOMINATE NUMBERS.

[The name is derived from the Latin *uncia,* meaning *a twelfth*]

OUNCE, a name given to the beautiful *snow leopard,* a member of the cat family, whose home is far up in the cold mountain regions of Central Asia. Its rough, heavy hair is nearly white, and marked with leopard-like spots; with this protective coloration, it can steal unnoticed over the snow and suddenly seize its prey. In its native rocky home, the ounce feeds chiefly on goats, sheep, or other animals, but seldom attacks man. Its tail is long and bushy, while the unusually warm coat of fur protects it from cold which others of the cat family could not endure. If the animal is taken into more temperate zones, the fur soon turns darker. See LEOPARD. M J H.

Scientific Name. The ounce belongs to the family *Felidae.* Its scientific name is *Felis uncia.*

[For illustration of members of this family, see the article CAT]

OUR LADY OF THE SNOWS, a name applied quite generally to Canada in earlier days, but now objected to by the people of the Dominion because it conveys a wrong impression of the country.

OUTCAULT, *out' kawlt,* RICHARD FELTON (1863-1928), an American illustrator, the creator of "Buster Brown," "Yellow Kid," and other popular characters. Outcault was born at Lancaster, O., was educated in Cincinnati, and began his career as a comic artist in 1895. For several years he was connected with newspapers in New York, in which his drawings were a distinctive feature of the Sunday supplements. Later he became the head of an advertising company in Chicago

His Creations. Outcault's character series, which have been published in book form, include *Buster the Busy Body, Buster Brown in Foreign Lands, Buster Brown and His Pets, Real Buster and the Only Mary Jane, Poor Li'l Mose,* and the *Yellow Kid* and *Hogan's Alley* series

OUTPOST PROVINCES. See EAST INDIES, DUTCH (History and Government).

OUTRAM, *oo' tram,* SIR JAMES (1803-1863), an English soldier and statesman, known as the "Bayard of India." He was born in Derbyshire, and went to India in 1819 in the service of the East India Company In various conflicts with the natives, and in the Afghan War of 1830, he rendered good service, and in 1857 joined the expedition against Persia It was during the Sepoy Rebellion, in 1857, however, that Outram chiefly distinguished himself. Offered the command of the relief forces sent to Lucknow, he refused to take precedence over General Havelock, whom he accompanied as chief commissioner of Oudh; and he had a large part in the victorious campaign against the insurgents In 1860 ill health forced him to return to England, where the rest of his life was spent. His title was granted in recognition of his services

OUTRIGGER BOAT, a boat with oarlock extended to increase the leverage of the oar. In the Indian and Pacific oceans, it is a canoe with a framework attached to the sides, to prevent upsetting. See illustration in the article PACIFIC ISLANDS

OUZEL, *oo' z'l.* See DIPPER.

OVALBUMIN, the albumen in the white of eggs. See ALBUMEN.

OVARY. See FLOWERS (Flower Structure)

OVATION. See TRIUMPH

OVEN BIRD, a common American warbler, formerly known as the *golden-crowned thrush,* from its resemblance to a small thrush. It is about six inches long, and has an olive-green back, dull-orange crown, and white breast spotted with black. Its singing note resembles the word *teacher,* repeated several times and in an ascending key. The oven bird nests from Kansas to Virginia, and northward to Manitoba and Labrador. It takes its name from its nest, which is built somewhat in the shape of a rude oven. This nest is made of grasses and clay, and it sometimes takes sev-

eral months to complete it. The eggs are four to six in number, and are white, speckled with cinnamon color. The oven bird lives wholly on insect food See WARBLERS D.L.



Photo Visual Education Service

THE OVEN BIRD

Scientific Name. The oven bird belongs to the wood-warbler family, *Mniotiltidae* Its scientific name is *Seiurus aurocapillus*

OVERHEAD EXPENSE. See ACCOUNTANCY (Cost Accounting).

OVERSHOT WHEEL. See WATER WHEEL

OVERTONES. See SOUND (Quality of Sound)

OVERWEIGHT. See OBESITY, LIFE EXTENSION (Rule 6)

OVID (PUBLIUS OVIDIUS NASO) (43 B.C.–A.D. 17), a celebrated Roman poet, was born at Sulmo, in the Apennine Mountains. His father gave him an excellent education but insisted on his following the profession of law, although his natural inclinations were toward a literary career. After studying for a time in Athens, he took up his residence in Rome, but being unfitted, through natural indolence, for a public career, he contented himself with one or two subordinate offices. Soon even these were given up, and he spent his time in writing and in the pursuit of pleasure. Ovid was twice married while very young, but each time divorced his wife shortly after marriage, and before he was thirty, was married for the third time.

About the year 9, an edict of Augustus banished Ovid from Rome to Tomi, a town on the shores of the Black Sea. The ostensible reason was the publication of the *Ars Amatoria* (Art of Love), but the real reason it is impossible to discover. Ovid speaks of the episode but vaguely, and it is supposed to have been connected with his knowledge of a love affair of the granddaughter of Augustus. Life in the rude and barbarous country to which he had been sent was a most unpleasant change from the luxurious life of a Roman man of letters, and Ovid himself and his many friends made repeated attempts to shorten the term of his banishment. or at least to secure a change of place; but all such attempts were in vain, and he died at Tomi.

Ovid's ease of style and his musical verse have made him popular despite the fact that he is always rather superficial in thought and in feeling, and he never shows any reverence.

His Writings. Besides *Ars Amatoria*, Ovid's works include *Epistolae Heroidum* (letters from heroines to their lovers); *Amorum Libri* (Love Elegies); *Nux*, the lament of a nut tree over the treatment received from all passers-by, *Fastorum Libri*, a sort of poetical calendar, and the *Metamorphoses* (Transformations), his best-known work, which contains an account of all transformations described in legend down to the time of Julius Caesar, who was changed to a star

OVIPOSITOR, *o vih poz' ih tur.* See ICHNEUMON FLY; GRASSHOPPER.

OVULE. See FLOWER (Flower Structure).

OWEN, *o' en,* ROBERT (1771-1858), the founder of the cooperative movement in England, and the first factory-owner to prove that an employer profits by helping his employees. He declared that "all poverty and crime are the effects of error in the various systems of training and government."

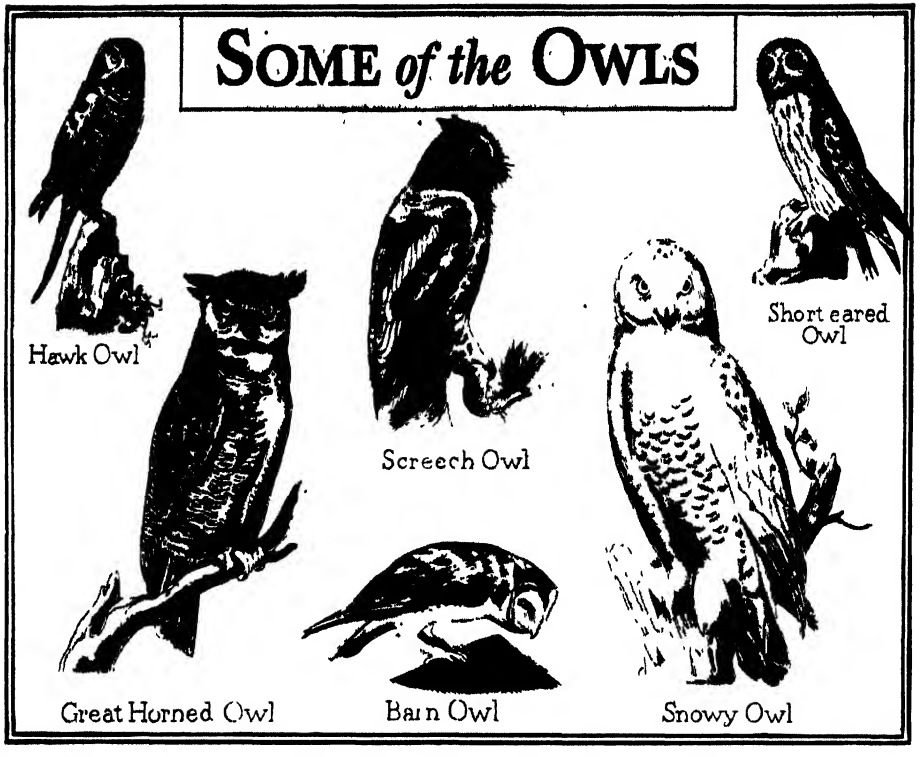


Photo: Brown Bros.

ROBERT OWEN

Owen was born in Wales, but, while still a boy, he became a cotton-spinner in England. He showed such pronounced ability that, when only nineteen, he was made a mill-manager. In 1799 he became part owner of mills at New Lanark, Scotland, and immediately began to apply his principles by establishing a paternal government among his factory people. He insisted upon cleanliness, temperance, and religious toleration, employed no help under ten years of age, and established free schools for children between the ages of five and ten.

In 1824 Owen purchased the property of the community village of New Harmony, Ind. (see COMMUNISM), but his experiment there failed, partly for lack of capital. Though the Lanark mills were profitable under his superintendence and he brought his people out of poverty, opposition on the part of his partners resulted in his retirement in 1828. He spent the rest of



In the hollow tree, in the old gray tower,
The spectral Owl doth dwell;
Dull, hated, despised, in the sunshine hour,
But at dusk—he's abroad and well!
Not a bird of the forest e'er mates with him—
All mock him outright, by day
But at night, when the woods grow still and dim,
The boldest will shrink away!
O, when the night falls, and roosts the fowl,
Then, then, is the reign of the Horned Owl!
—BARRY CORNWALL. *The Owl*

his life advocating community villages for the poor, coöperation, and socialism, which were then new doctrines Most of his experiments in behalf of his views were failures See COOPERATION.

OWENSBORO, KY. See KENTUCKY (back of map).

OWEN MEREDITH, the pen name of the second Lord Lytton See BULWER-LYTTON

OWEN'S LAKE. See CALIFORNIA (Waters), WHITNEY, MOUNT.

OWL, a solemn-looking solitary bird of prey which hunts for food at night It has been called "the night watchman of gardens and orchards" There are about 200 species. Some are so tiny that one can be worn on a woman's hat, others are as large as some of the eagles. Their eyes are especially fitted to see in very dim light, and in the daytime they sleep in some secluded spot. Their eyes are set close together and cannot move in their sockets as do human eyes; so if owls wish to look in any direction other than straight ahead, they must turn their heads. An owl's inability to see well in the daytime is balanced by its hearing, which is very keen. A ruff of feathers surrounds each eye, and the effect is an odd appearance of wisdom, but owls are not as wise as they look. On the contrary, they are rather stupid. As an emblem of wisdom, the owl in the mythology of the old Greeks was sacred to Athene (the Roman Minerva), goddess of wisdom.

Some species have tufts of feathers which look like ears or horns. All are short, bulky birds. Their bills are short, strong, and hooked. The legs are short and powerful, usually feathered to the toe. The body plumage is soft and thick, and the wings are especially adapted for quick, noiseless flight, helpful when the owls are pursuing their living prey of mice, squirrels, and other gnawing creatures, birds, and insects. The prey is usually swallowed whole, if not too large, and the bones and hairs are later ejected through the mouth in pellets. Holes in trees, caves, old buildings, and church belfries are the favorite homes of owls, and there they roost, sleeping, or blinking in the dazzling light of day. There, too, they lay their white eggs,

numbering from two to ten, which hatch into downy, odd-looking young.

The call of owls, usually heard at night, is mournful, and sometimes is a weird, startling hoot which has caused some people to regard the bird with superstition Owls really do more good than harm, however, for they are voracious eaters of insects and rodents.



ARCTIC OWL Photo U & U

Some Species. The little *screech owl*, eight inches in length, and in color gray or red, is one of the most common species in the United States and Southern Canada. It is especially valuable as a destroyer of mice, and should be encouraged to remain about barns and granaries. Its cry is not a screech, but a low, mournful whistle. Gray *barn owls* are also numerous. Barn owls form a separate family. The *great horned owl*, common throughout North and South America, is a large brown and white bird, often destructive to poultry and game birds It is the only owl in North America sometimes harmful to agriculture The *snowy owl* of the north is a large, handsome bird which hunts by day and attacks ducks and other valuable waterfowl *Long-eared owls* appear in the woods of both hemispheres *Short-eared owls* are widely distributed over prairies and meadow lands The *burrowing owls* of Western America live in the homes of prairie dogs and other ground animals, and prey upon those little burrowing creatures They also eat grasshoppers and lizards The sooty-brown, fierce *hawk owl* also hunts by day. The *elf owl* of the desert region of the Southwest, less than six inches long, is the smallest of the owls



GREAT GRAY OWL



WOOD OWL

No owls should be killed unless actually seen doing damage to poultry Even the great horned owl is useful when feeding on mice and rabbits. The nest of a pair of these birds was observed during two seasons, and it was found that the birds had been feeding principally on crows and rabbits No signs of poultry were found, although there were several farms within a mile of the nest D L

Scientific Names. Owls are often grouped with eagles and hawks in the order *Raptores*, but many naturalists isolate them in the order *Strigaformes* The species mentioned above are classed as follows screech owl, *Otus asio*, barn owl, *Aluco pratincola*, great horned owl, *Bubo virginianus*, snowy owl, *Nyctea nyctea*, long-eared owl, *Asio wilsonianus*, short-eared owl, *Asio accipitrinus*, burrowing owl,

Speotyto cunicularia, hawk owl, *Surnia ulula caparoch*, elf owl, *Micropallas whitneyi*

OWL AND THE PUSSY CAT (poem) See LANGUAGE (Language Work in the Home First Year).

OWL RIVER. See SOUTH DAKOTA (Rivers and Lakes).

OWOSSO, MICH. See MICHIGAN (back of map).

OWYHEE, *o wi' he*, **RIVER.** See NEVADA (Rivers and Lakes)

OX. See CATTLE.

OXALATES, *ok' sah lates* See OXALIC ACID, below.

OXALIC, *ok sal' ik*, **ACID,** one of a series of organic acids, of great importance in industry. At ordinary temperatures, it is a white crystalline solid, odorless, but having an acid taste. Its salts, called *oxalates*, are found in several plants, including rhubarb, dock, tomatoes, and wood sorrel. (The latter, the botanist's *Oxalis acetosella*, furnishes the name of the acid.) Oxalic acid is very poisonous, and has often been taken by mistake in place of Epsom salts, which it resembles. Antidotes for oxalic poisoning include calcium salts, limewater, plaster, and magnesia.

The compound is prepared commercially by heating sawdust (cellulose) with caustic potash and caustic soda. It is soluble in water, and is used in calico printing, in the bleaching of flax and straw, as a cleaning agent on brass and copper, to remove ink and rust stains, and in dyeing and tanning. Great care should be exercised when it is used in the house. T B J.

Chemical Formula. The formula for crystals of oxalic acid is $C_2H_2O_4\ 2H_2O$. In this form it is a union of carbon (two atoms), hydrogen (two atoms), and oxygen (four atoms) with two molecules of water ($2H_2O$). When heated to 212° F., the crystals lose the water molecules and the anhydrous acid ($C_2H_2O_4$) is evolved. See HYDRATES.

OXEYE DAISY. See DAISY.

OXFORD, ENGLAND. See ENGLAND (The Cities).

OXFORD MOVEMENT, a revival in the Church of England which began at Oxford in 1833. The immediate cause was the preaching by John Keble of a powerful sermon on national apostasy. A few men joined Keble in his attempt to reclaim the Church from the state of spiritual apathy into which it had fallen, and to restore to public worship the symbolism that was possessed by the Roman Catholic Church in the Middle Ages. The originators of the movement began the publication of a series of tracts called *Tracts for the Times*. These tracts treated of the doctrine, polity, and worship of the Church. Others joined the movement, and for a time it grew rapidly. Its most eminent advocate was John Henry Newman, who later became a cardinal in the Roman Catholic Church (see NEWMAN, JOHN HENRY). Because of the tracts, the leaders of the movement were termed *Tractarians*, and their doctrine was known as *Tractarianism*.

With the withdrawal of Newman in 1845 the original organization began to disintegrate, but the movement was broadened and exerted a considerable influence for a number of years. Its chief outcome was the establishing of the High Church branch of the Church of England. Other results were the quickening of the spiritual life of the Church and raising the standard of worship.

While the Oxford Movement as such spent its force a generation or more ago, there has been a revival of its spiritual aims since the opening of the present century. In 1927 and 1928, especially, the High Church, or Anglican, party sought to revise the Prayer Book in order that the service might be modified in the direction of the medieval Church. This effort was defeated by the House of Commons, but the bishops voted to ignore the decision of Parliament. See CHURCH OF ENGLAND.

OXFORD UNIVERSITY, the oldest university of England, and one in which Americans are especially interested because of the system of Rhodes Scholarships, by which a limited number of students, from each English-speaking country in the world, may gain admission to it and have their expenses paid at the rate of $2,000 a year for three years (see RHODES SCHOLARSHIPS).

Oxford University is situated at Oxford, England, about fifty miles northwest of London. There are a number of traditions relating to the origin of the institution, but no authentic records of the existence of a school at this place previous to 1167 have been found, though there is record of continental lecturers at Oxford as early as 1117. During 1167 or 1168, when the relations between England and France were broken, foreign students were expelled from the University of Paris, and many who returned to England went to Oxford with their masters, and continued their studies.

This early school was a guild whose chief purpose was to control teaching by restricting the number who might engage in the work of instruction. There is no record of the plan of university organization previous to 1214. It is probable that the masters elected one of their number as head officer and bestowed upon him the title of chancellor, a title which the head of the university still bears. The students organized themselves into groups, corresponding in some respects to modern college fraternities. These groups received licenses from the university, and their members lived in homes or inns which were known as halls.

There are twenty-two colleges and three private halls, the three earliest of which are University College, founded in 1249 by William of Durham, Balliol College, founded by John Balliol about 1263; and Merton College, founded in 1264. Among these, Merton is particularly interesting as being the first college in the modern sense, and its organization became a model for all subsequent colleges at both Oxford and Cambridge. Of the other colleges, the best-known are Exeter, Queen's, Magdalen, Corpus Christi, Christ Church, and Trinity. Women have been permitted to attend lectures since 1884, and since 1920 they have been admitted to full membership, and allowed to take degrees.

Upon matriculation, the student is assigned a tutor who guides and advises him through his collegiate career. He outlines for him the things he is expected to know, the examinations he must pass, and guides his reading Instruction is by lecture almost exclusively, and there is no parallel to the recitations or quizzes of the American colleges Notices of the lectures are posted, these are public, but attendance is not compulsory It is the duty of the student, guided by his tutor, to attend those pertinent to his studies He must supplement the lectures with his own reading, with the object of passing the examinations.

The university, and not the colleges, conducts the examinations and grants the degrees. There are two types of bachelor degrees, which differ in the length and intensity of study required by the candidate A bachelor's degree with honors requires more stringent examinations, and may be followed by a Master of Arts degree without further examination, by keeping the name on the books for a definite length of time. The degrees of Doctor of Divinity, Law, Medicine, Literature, Science, Music, etc , are also granted

In average years, the faculty numbers about 150, exclusive of the college tutors, and the undergraduate student enrollment is approximately 4,300.

OXIDATION, *ok sih da' shun*, the process which takes place when oxygen is chemically combined with any other substance (see OXYGEN) The compound which results from the union of oxygen with another element, or with compound radicals, is called an *oxide.* The substance to which oxygen is added is said to be *oxidized.* A good *oxidizing agent* is one that gives up its oxygen to a substance more readily than air. The substance deprived of oxygen is said to be *reduced.* Examples of oxidation are the rusting of iron, the burning of wood in air, the transforming of cider into vinegar, the process of breathing, and the decay of vegetable and animal life Oxidation may be slow or fast Breathing, rusting, and decay are examples of slow oxidation; burning of fuel, accompanied by heat and light, is rapid oxidation (see COMBUSTION; RUST). T.B.J.

OXUS, *ok' sus*, **RIVER.** See ARAL SEA.

OX WARBLES, larvae of the botfly (which see).

OXYGEN, *ok' sih jen* This life-giving gas is the most abundant of the simple substances, or elements, that make up the earth and its air and water spheres We owe the term *oxygen* to the French chemist Antoine Lavoisier (1743-1794), who, thinking that the element was an essential part of all acids, gave it a name meaning *acid-producer.* Because of its relation to life, oxygen is sometimes called *vital air* By volume, it constitutes one-fifth of the atmosphere, and by weight, about one-half of all the rocks, and eight-ninths of water Oxygen is combined with hydrogen in water, the molecules of which consist of two atoms of hydrogen to one of oxygen. Oxygen is a little heavier than air, and without color, odor, or taste Its symbol is *O*, and its atomic weight is 16. One can easily prepare it in the laboratory for experimental purposes, by heating in a closed retort a mixture of potassium chlorate and black oxide of manganese, and collecting the gas in inverted jars over water.

Experiments with Oxygen. The following simple and interesting experiments can easily be performed with oxygen Since the gas is heavier than the air, it will remain for a short time in a jar with a cover of glass or cardboard. The cover should be placed over the mouth of the inverted jar containing the gas, and the jar should then be lifted from its position over the water, and set in place for the experiment

1 Attach a match to a wire Light the match and place it in the jar Notice how much more brightly it burns than in the air

2 Place burning sulphur in a jar of oxygen and notice the bright flame produced.

3 Dip the end of a wire or of an old watch spring in sulphur Light the sulphur and place the wire in a jar of oxygen The wire will burn and throw off brilliant sparks At the close of the experiment, the inside of the jar will be coated with oxide of iron (iron rust).

How Oxygen Supports Life. If an animal or a plant is deprived of air, it dies. By respiration, the air is drawn into the lungs; there it gives up a part of its oxygen to the blood, by which it is distributed to all parts of the body. The oxygen unites with the tissues, or *oxidizes* them, and in this way the heat is produced which keeps the body at a uniform temperature. Among the waste products formed during this process is carbon dioxide, which is expelled from the system through the lungs. Oxygen thus purifies the blood, and by a process of slow combustion (oxidation) of the tissues, supplies the body with heat.

Plants, on the other hand, take in a large quantity of carbon dioxide through their leaves and give off oxygen, but this action takes place only under the influence of direct sunlight. At night, when they are not manufacturing food, they are using oxygen and giving out carbon dioxide [see CARBONIC-ACID GAS (Interchange Between Plants and Animals)].

Uses of Oxygen., Oxygen forms many combinations in nature, and without it many common processes would be impossible. Fires would not burn, and many substances, such as iron and steel, could not be produced; but the pure gas was not until recently considered to be of any practical use. Formerly, it was supposed that, if one should breathe pure oxygen, he would burn his life out in a short time. We now know that this is not a fact, and oxygen is frequently used to restore a person who has been suffocated, or one who is unable to obtain enough air, as in cases of pneumonia, asthma, and croup. Divers now carry tanks filled with oxygen under pressure, and without it the submarine could remain under water only a short time. Aeronauts who fly to great heights are also provided with oxygen tanks. Oxygen in the air acts as a purifier, and aids in the disposal of sewage.

For commercial purposes, oxygen is stored under strong pressure in iron cylinders. When mixed with hydrogen in proportion of one part hydrogen to two of oxygen and burned at the mouth of a tube with a small aperture, it forms an intensely hot flame (called *oxyhydrogen*). Under high pressure and at a very low temperature, oxygen can be liquefied. For commercial purposes it is made from liquid air. T.B.J.

Liquid-Oxygen Explosives. The enormous consumption of ordinary explosives in the military operations of the World War caused a search for some substitute that could be used in industrial blasting (mines, tunnels, and the like). For this purpose, liquid-oxygen explosive, usually referred to as L.O.X., was developed by Germany. After the war, improvements in the methods of using it were made, and it has now come into general use for many industrial operations. It is less expensive than dynamite, and if employed under proper conditions, it has a large field in both open-cut and underground blasting.

L.O.X. is used in a paper cartridge filled with an absorbent material such as lampblack. The cartridge is saturated with liquid oxygen, and then detonated exactly like a dynamite cartridge. Because liquid oxygen evaporates rapidly, the cartridge begins to lose strength as soon as it is removed from the liquid. Hence it is desirable to fire it within a few minutes after removal from the liquid oxygen, in order to obtain the greatest explosive effect.

The United States Bureau of Mines has issued cautions in reference to the use of L.O.X. The chief dangers are: fires in gaseous or dusty mines, and the formation of deadly carbon-monoxide gas in mines that are not well ventilated.

Related Subjects. The reader is referred to the following articles in these volumes

Acetylene	Combustion
Air	Fire
Allotropy	Hydrogen
Atomic Weights	Oxidation
Carbonic-Acid Gas	Ozone
Chemistry (Elements)	Rust

OXYGENATED, WATER. *ok' sih jen ay ted*, See HYDROGEN PEROXIDE.

OXY-HEMOGLOBIN, *ok' sih he mo glo' bin.* See ABSORPTION (In Physiology).

OXYHYDROGEN, FLAME. *ok sih hi' dro jen*, See HYDROGEN.

OXYHYDROGEN LIGHT. See LIMELIGHT.

OYAMA, *o yah' mah*, IWAO, Prince (1842-1916), a Japanese field marshal and statesman, was born in Kagoshima, the second son of a samurai of Satsuma. He was sent to Europe to observe the military tactics of the Franco-German War, and upon his return home, rose to the rank of lieutenant general. In 1883 to 1885, he visited France and Switzerland for the purpose of studying military science.

During the Chinese-Japanese War (1894-1895), Oyama commanded the second army corps, and after severe fighting, occupied Kinchow, Port Arthur, and Wei-hai-wei—the three powerful strongholds of China In recognition of these services, he received the title of marquis and the order of the Grand Cordon of the Rising Sun. Three years later (1898), Oyama was promoted to the highest military rank, that of field marshal. In the Russo-Japanese War (which see), he was commander in chief of the Manchurian army, and the great victories of the Japanese forces were largely due to his tactics. In 1906 Oyama received the title of count from his government, and the following year, the mikado bestowed on him the rank of prince.

OWYHEE DAM. See OREGON (Rivers)

OYSTER. A schoolgirl, required in an examination to give a definition of oyster, wrote, "An oyster is a mushy substance enclosed in a shell." A great many people might regard this as an entirely adequate definition, for it is difficult to think of the headless, limbless, and speechless oyster as an animal, or, in fact, as anything but a soft substance that, when served on the half shell, is a delicacy which has few equals. But this same "dumb" oyster, though it is meagerly equipped with special senses, is more valuable to man than any other single product of the fishing industry, and the 22,000,000 bushels of market oysters produced in the world every year provide a valuable article of food for the people of at least twenty-five countries.

Description. Among the subdivisions of the animal kingdom, the oyster is classed with the *mollusks* (which see), a group containing animals with soft, fleshy bodies covered usually by shells. The oyster is a denizen of salt waters, thriving best in quiet, shallow inlets. As this stanza of an old song puts it—

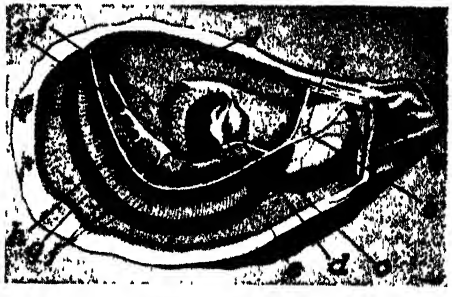
> The herring loves the open sea,
> The mackerel loves the wind,
> But the oyster loves the quiet tide,
> For it comes of a gentle kind.

The shell of the oyster, which forms a little house for it to live in, consists of two parts called *valves*, which are fastened at one end by a hinge. By means of a strong *adductor* muscle, which attaches the soft body to the shell, these valves can open (about half an inch) and shut as the inmate desires. In its natural state, the oyster rests on the left valve, which is larger, thicker, and more convex, or hollowed out, than the right one. Usually, it attaches itself by this left valve to a rock or other object on the sea bottom, remaining fixed for life, and sometimes several oysters lie fastened to one another. If it so happens that there are too many in one group, or bed, the under ones may sink into the mud and die of starvation and suffocation.

Every oyster shell is lined with a fold of muscle called a *mantle*, which grows from each side of the body. The limy substance which makes up the shell is secreted in layers by the mantle, that on the inside being called *mother-of-pearl* (which see). Anyone who examines the outside of an old oyster shell can see the succession of layers overlapping, like shingles on the roof of a house As each layer represents a season's growth, one may judge an oyster's age by the thickness of the shell. It is claimed that oysters, if left undisturbed, may live to be 100 years old. Sometimes a grain of sand or other hard object becomes lodged on the inside of the shell. In such cases, to protect its soft body from irritation, the oyster secretes mother-of-pearl over the object, and in due time a pearl (which see) is formed. The oysters that are famed as pearl-makers, however, are not the edible species of the north temperate zone, but are found in the tropics.

Although the oyster has no head, being all body, it has a mouth, consisting of a funnel-shaped opening at the narrowest part of the body. This mouth is provided with minute, finger-like projections, which select from the sea water the myriad plant and animal organisms on which the oyster feeds. It has a good-sized stomach, which is connected with the mouth by a short gullet; a digestive gland; reproductive organs; two pairs of gills for breathing; an intestine; a dark-green liver; a two-chambered heart; and an elementary nervous system.

How It Develops. Oyster eggs are yellowish in color, and so minute that a mass of them would look like so much thick cream. An average-sized oyster of the eastern American coast may produce as many as 16,000,000 in a season. They are ejected from the parent oyster in a sort of milky spray. A newly hatched oyster is a cup-shaped object about the size of the point of a needle; it is able to swim



PARTS OF THE OYSTER

(*a*) Hinge
(*b*) Ganglia of the nervous system
(*c*) Blood vessel from gills to auricle of heart
(*d*) Ventricle
(*e*) Auricle
(*f*) Pores from which water issues into bronchial canals after passing through gills
(*g*) Mantle (arrows show direction of current produced by cilia)
(*h*) Gills
(*i*) Outline of organ of Bojanus, the so-called kidney
(*j*) Adductor muscle

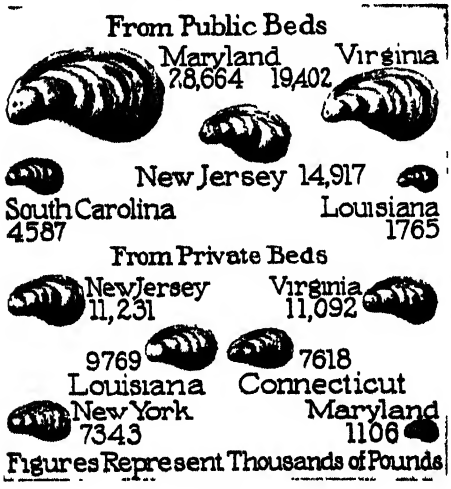
about freely by means of fine, hairlike growths, or cilia. The larval oyster has a rudimentary foot, which is used as a "feeler" by the animal in selecting a place of attachment.

How It Finds Its "Home." When it is very young, an oyster for an exciting period of about two weeks swims around, looking for a home on which to settle down, and the step is an important one; for when it attaches itself to a rock or other stationary object, the attachment is permanent. Men have discovered that, before fixing upon a definite location, the young mollusk sometimes circles around and tests every part of an object with its one and only foot. When it finds a place that seems satisfactory, it fastens itself to that spot with its foot, which, the need of traveling having ended, serves as an anchor for the rest of its life.

Growth. Soon the primitive shell is formed, and the creature develops into an adult oyster. In a month a young oyster is about the size of a pea; at the end of a year it is as large as a silver quarter; and after that it grows about an inch a year until it reaches full size at the end of three or four years.

Hazards of Oyster Life. So many other animals prey upon oysters that they would become extinct if such countless numbers of eggs were not produced. When the swimming larvae reach the surface, they are gulped down by fish at the rate of several thousands a second, and after they begin life as fixed objects on the

sea floor, they are attacked by starfish, drills, rays, and other hungry marine enemies. Among these is the boring snail, which pierces the shell with its rasping tongue, and proceeds to draw out the soft parts at its leisure. One



OYSTER PRODUCTION
Figures represent averages for three years.

scientist has figured that a newly hatched oyster has one chance in 1,145,000 to attain adult size.

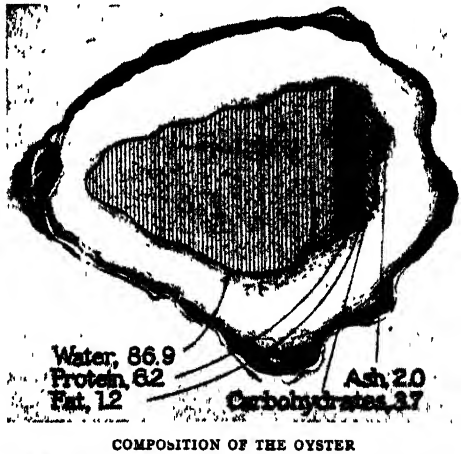
The Oyster Industry. The popularity of the oyster as a table food is responsible for an industry of gigantic proportions. The oyster beds of the coast waters of the Eastern United States, especially those in Chesapeake Bay, are among the most productive in the world. In America, oyster-fishing is carried on from Maine to Florida, in the Gulf of Mexico, in San Francisco Bay, and in the coast waters of Oregon and Washington. Baltimore is the chief market for the industry, and the Chesapeake Bay district is the most extensive single area producing oysters.

The most important oyster beds of Canada are in the Gulf of Saint Lawrence and off the coast of British Columbia.

In Europe, England and Wales, France, Holland, and Italy are the leading countries in oyster production. The world output of market oysters is estimated at 22,000,000 bushels. The leading states in oyster production are Maryland, Virginia, New Jersey, New York, Mississippi, and Louisiana. Maryland always leads, having a yearly production equal to about one-fourth that of the entire country. The total annual production of market oysters for the United States as a whole is approximately 17,000,000 bushels, representing a considerable falling off of the crop since the beginning of the century.

Oyster Culture and Propagation. Efforts have been made to prevent the threatened extinction of this popular sea food, by a system of oyster culture. Oyster-rearing areas are leased from the state, and are marked off carefully by buoys, that each "farmer" may distinguish his plot. The farm must have a stable bottom, for loose, shifting sand or deep, soft mud is liable to cover and smother the young oysters, called *seed* oysters. Objects to serve as lodging places, such as clean shells and tiles, are placed on the sea floor before the seed is planted. Before marketing, the oyster-planters often transfer the crop to warmer, more shallow waters, to permit the oysters to fatten or improve in flavor. This system is called *conditioning*. More recently, experiments in propagating oysters by artificial fertilization of the eggs and scientific care of the larvae have been made by the New York State Conservation Commission. Machines operating like a cream separator are used to separate the larvae from water grown stale, and the growing crop is kept supplied with suitable food and fresh water. The methods used have been proved commercially profitable, and it is expected that they will solve the problem of the diminishing oyster supply. Experiments are also being made in cross-breeding, with the object of improving quality.

Catching and Marketing. In middle latitudes, the oyster-harvesting season occurs during the fall and winter. (The spawning season



COMPOSITION OF THE OYSTER
As a heat producer the oyster is not a desirable article of food. Its fuel value is 230 calories per pound, and this is but little greater than that of many vegetables—about the same as onions, nearly twice that of cabbage, but only one-fourth as great as peas or beans.

in Chesapeake Bay lasts from April to October.) In shallow waters, the shells are scooped up from the sea with huge tongs, or pincers, that open and shut like shears, but in deeper waters, the catch is obtained by means of great



The Oyster Industry. A shipload of oysters off the coast of South Carolina; the men are dragging the catch from the sea bottom. At right, acres of oyster beds at Cançale, France.

Photos: U & D

dredges operated by hand or steam power. The business of preparing oysters for the market requires thousands of workmen. Oysters that are to be shelled, or "shucked," are placed with the edge of the shell on a chisel blade, which is fixed on a block. With a sharp blow from a wooden mallet, the shucker cuts the shell through, and then, slipping a broad-bladed knife into the gap, he lays the two valves out flat. The muscle which joins the fleshy body to the shell is next severed, and the naked oyster is ready to be washed and packed for shipment. Unshelled oysters are also marketed in large quantities, as there is a wide demand for oysters served raw on the half shell. The practice of placing oysters in fresh water for the purpose of "plumping them" is sometimes attended with danger, as typhoid and other germs may be introduced thereby. As to the season for buying oysters, one should bear in mind the saying—"It is unseasonable and unwholesome in all months that have not an R in their names, to eat an oyster."

Food Value. As shown in the illustration on page 5284, besides water, protein, fat, and ash, which are found in all meats and food fish, the flesh of oysters contains over three per cent of carbohydrates (starches and sugars). On an average, there is about the same quantity of nutritive substances in a quart of oysters as in a quart of milk, or two pounds of fresh codfish, or a pound of bread, or three-fourths of a pound of beef. Raw oysters, seasoned with salt, pepper, lemon, ketchup, or other sauce, are an excellent appetizer and a popular delicacy with which to begin a dinner. Oysters are also nutritious and tempting when served in soups, when broiled, fried, or scalloped, or when used in turkey dressing. S.H.S.

Scientific Names. Oysters belong to the family *Ostreidae* The oyster of the eastern American coast is *Ostrea virginica*; the European species is *O. edulis*

OYSTER CATCHER, the name of a family of wading birds, found on seacoasts in most warm sections of the world. The name refers to the characteristic sharp-edged, chisel-shaped bill with which an oyster catcher opens oysters, clams, and other mollusks, upon which it feeds. The common oyster catcher of the United States is found on both coasts of the Americas, but usually is not seen north of New Jersey. It has smoky-brown body plumage, black head and neck, and white under parts, and is about a foot and a half long. A related species, without white in the plumage, is found on the Pacific coast. The *sea pie* of Great Britain is the common European species. Oyster catchers deposit their three or four eggs, which are buff, marked with dark brown, among the bare pebbles. D.L.

Scientific Names. The oyster catchers constitute the family *Haematopodidae*. The Atlantic species is *Haematopus palliatus*; the Pacific is *H. bachmani*; the European, *H. ostralegus*.



THE OYSTER CATCHER

OYSTER PLANT, OR **SALSIFY,** *sal' sih fi*, a biennial garden vegetable whose fleshy root has an oyster-like flavor. The plant is native to Mediterranean countries, but is well adapted to the soil and climate of the Northern United States. The tapering roots are used in Europe and America as a table vegetable. A common method of preparation consists in cutting them into small pieces, boiling until tender, and creaming. They are also very palatable boiled, then dipped in cracker crumbs and fried, and they impart their agreeable flavor to soups. Salsify is cultivated in the same manner as the parsnip (which see), and the roots are easily kept over winter, either in the ground or stored in cool, moist earth. B.M.D.



OYSTER PLANT
(*a*) Root; (*b*) fruit, (*c*) stalk and flower

Scientific Name. The oyster plant belongs to the composite family, *Compositae*. Its botanical name is *Tragopogon porrifolius*.

OZAKA, OR **OSAKA,** *o zah' kah,* the largest city in the Japanese Empire. See JAPAN (The Cities).

OZARK, *o' zahrk,* **MOUNTAINS,** an irregular range of hills extending from the southern part of Illinois into Missouri, and then into Kansas, Arkansas, and Oklahoma. They are classed with the oldest mountain regions in the world, and vary from 1,500 to 2,000 feet in altitude, the highest point being Pilot Knob, in Iron County, Mo. The Ozarks are covered with timber, and the mineral deposits, which include lead, coal, and iron, are very extensive. Many valleys rich in cereals, fruit, and livestock penetrate different parts of the group. The Ouachita Mountains, south of the Arkansas River, are a continuation of this group. See MISSOURI (The Land; Climate).

OZONE, a form of oxygen which is more active, more concentrated, and heavier than ordinary oxygen, and which has a pungent odor resembling chlorine. Ozone is an allotropic form of oxygen (see ALLOTROPY). In nature it is produced chiefly by lightning, silent electrical discharges from thunderclouds, and by the action of the ultra-violet light of the sun on oxygen in the upper air. The odor of ozone is perceptible after a thunderstorm, when the air seems purer and more invigorating. On an average, however, there is more ozone in the winter atmosphere than in summer air, because it decomposes quickly under conditions of heat and moisture.

It has been estimated that ozone exists in country air in the proportion of one part in 450,000. Over cities, where the air is full of organic matter, ozone readily changes to ordinary oxygen because it is constantly oxidizing the organic substances, that is, giving oxygen to them. A molecule of ozone contains three atoms of oxygen; a molecule of ordinary oxygen is made up of two atoms. In the oxidizing process, one atom of oxygen is withdrawn from the ozone molecule. Ozone is one of the most powerful oxidizing agents known.

Ozone is prepared for commercial purposes by passing a silent electrical discharge through oxygen or atmospheric air. The apparatus used is called an *ozonizer.* Three volumes of oxygen are condensed to two when ozone is formed. The gas is employed in the bleaching of dyestuffs and fabrics, to free impure air of bacteria, and to purify city water supplies. It has the advantage of leaving behind no injurious products after any chemical activity. See OXYGEN T.B.J.



Relics of Cannibal Days. The Fiji Island people are now nominally Christians In the days of cannibalism, the dugouts seen in the illustration were gongs which, struck with wooden clubs, called the people to a feast. Now the Christian natives employ the same method as a summons to religious meetings.



MALE TYPES IN THE ISLANDS OF THE PACIFIC

Guinea; the southernmost lie slightly north of the equator. Until 1914 they were possessed by Germany, but since the World War are mandated to Japan. Yap is the most famous of the group, with a population of about 8,500. The chief export is copra.

Easter Island, lying about 2,000 miles west of South America, is about thirteen miles long and seven miles wide. It was so named because it was discovered on Easter day in 1722. It is famous for certain images and stone carvings representing men from their waist upward, remnants of the culture of a race which has disappeared. The present inhabitants are Polynesians, and they number about 100. The island is in the possession of Chile.

Fiji, *fe' je,* **Islands,** a group of about 250 islands, of which only eighty are inhabited, lying west of the International Date Line, southwest of Samoa. They are considered the most important British islands in the mid-Pacific waters. The entire group covers an area of 7,435 square miles, and all are of volcanic origin, with peaks rising 3,000 feet above the sea. The people were, until quite recent years, cannibalistic and their religion was ancestor worship; the latter still survives to a great extent, but the majority of natives under British rule have embraced Christianity and the methods and manners of civilization. The native population is about 162,000, and there are about 4,000 white people.



Photo: P & A

ISLANDERS GO A-YACHTING

The picturesque charm of the South Seas is nowhere more in evidence than in the native outrigger boats. Many of these vessels have an outrigger on each side. The sails are of matting

Friendly Islands. See *Tonga Islands,* below.

Gilbert Islands, a group of small islands lying on the equator, with a total population of about 30,000, nearly all natives. Great Britain owns them.



Photo U & U

THE HILLS OF ONE OF THE FIJI ISLANDS

The town of Levuka, on the island of Ovalau, once the capital of the Fiji group, the capital is now sixty miles distant, on Vitilevu

Guam, described in its alphabetical place in these volumes.

Mariana Islands, formerly the Ladrones, lie south of the equator, and, until the World War, were German possessions. The League of Nations mandated the group to Japan, with the exception of Guam, the largest of the islands, which belongs to the United States (see GUAM). There are sixteen islands in the Mariana group, and they lie about 1,500 miles east of the Philippine Islands. The name *Ladrone*, meaning *robber*, was applied by the Spanish, for they found thievish traits characteristic of the natives. The group comprises about 420 square miles.

Marquesas, *mahr ka' sas*, **Islands,** eleven in number, only six of which are inhabited, have a total area of 480 square miles. They have been a French possession since 1842, but are of no great value, the number of inhabitants being only about 3,400. The Marquesans are a superior native group physically, and they have adopted the customs of civilization and the teachings of Christianity. Breadfruit is the chief article of subsistence. It grows abundantly



Photo U & U

A NATIVE GIRL OF THE SOUTH SEAS

Marshall Islands, two chains of small islands, mostly of lagoon formation, about twenty-five in number. They were German from 1885 to 1914, when they were lost to the Allies in the World War. By mandate they are now governed by Japan. The islands lie north of the equator, east of the Caroline group, and northeast of New Guinea.

New Britain Archipelago (formerly known as BISMARCK ARCHIPELAGO) Germany possessed the group from 1884 until they were taken by the Allies in the World War and renamed. There are about one hundred islands, the largest of which gave the name to the entire group. They were mandated to Australia by the League of Nations, effective in May, 1921. The New Britain Archipelago lies northeast of the island of

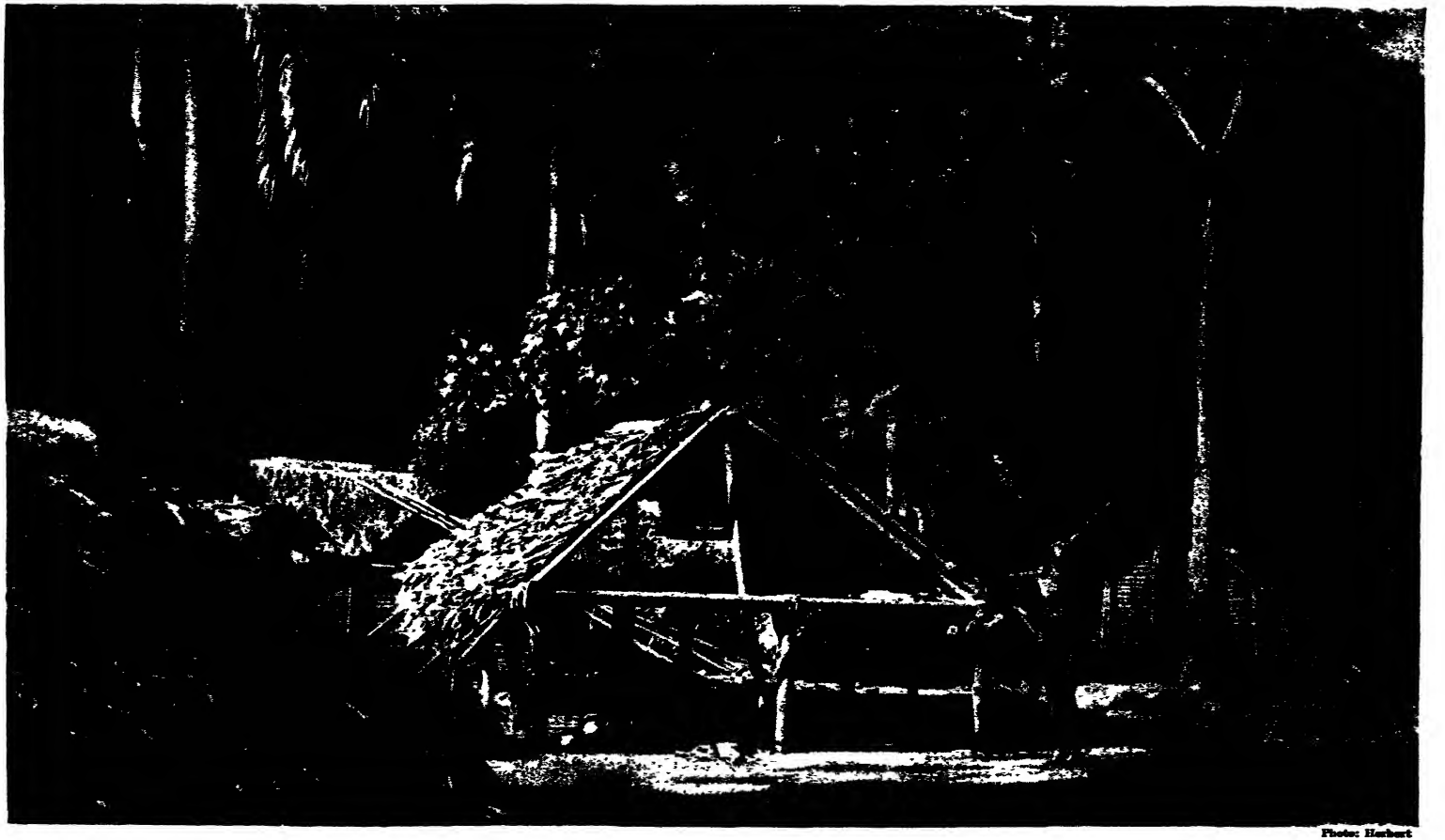


Photo: Herbert

A "Main Street" in the Fiji Islands. A plain, straw-thatched roof on stilts, with a floor midway between the eaves and the ground (a protection against snakes and small animals) is the average home. A better one is shown in another illustration, page 5292.

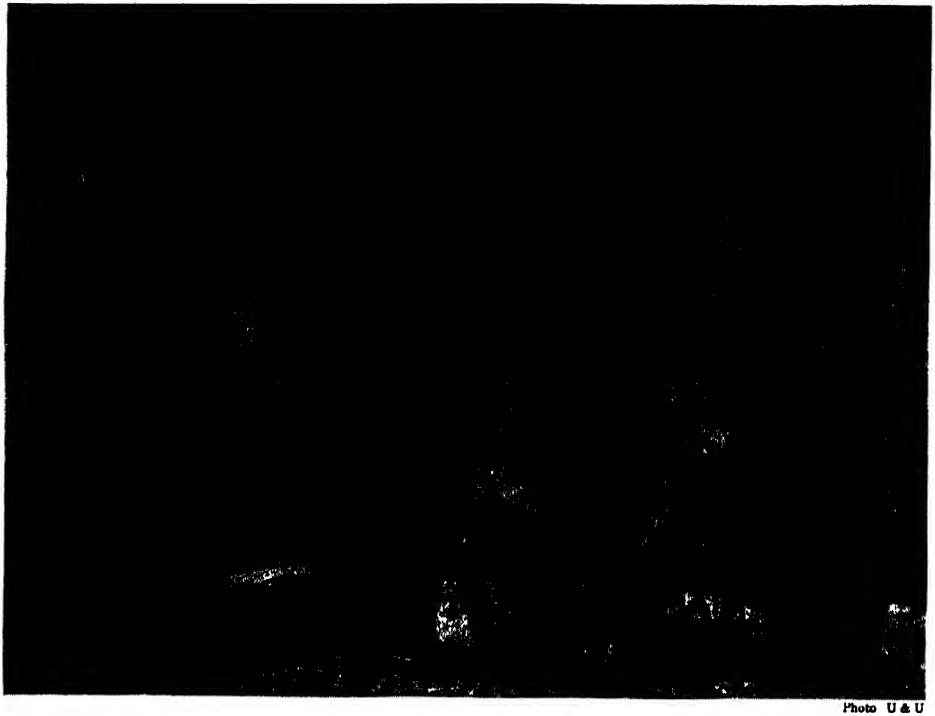


Photo U & U

TATTOOING, A NECESSARY CEREMONIAL

Before a man may be admitted to a clan in the South Seas, he must have the design tattooed on his back As the design usually covers almost all of the back, the process is long and painful.

New Guinea. It has a population of about 176,000.

New Caledonia, one of the largest islands in all Oceania, about 240 miles long and only 30 miles wide, with an area of 7,650 square miles. It belongs to France. It is one of the chief sources of the world's nickel, and there are other deposits of gold, silver, lead, copper, iron, and coal. There is a thriving import and export trade, consisting of minerals, meats, and coffee. Numea, the chief port, is connected by rail with Bourail, the capital. Until 1896, France used New Caledonia as a convict settlement. The population is about 50,000, and over half are natives of mixed blood.

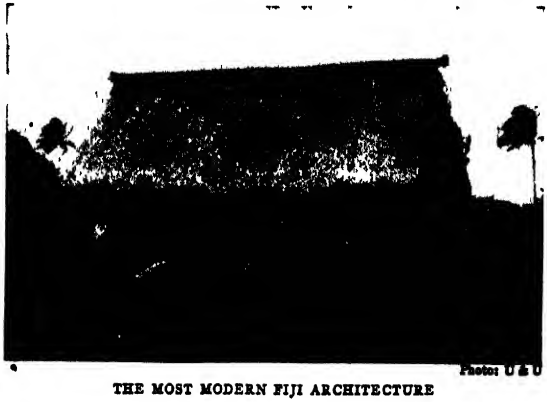


Photo U & U

THE MOST MODERN FIJI ARCHITECTURE

New Hebrides, a group lying about midway between Australia and the Fiji Islands, and almost north of New Caledonia. They are owned jointly by England and France, with dual administration of government. The interests of all nationals are guaranteed. The native population is between 55,000 and 60,000, and there are about 1,000 Europeans. All tropical fruits are grown.

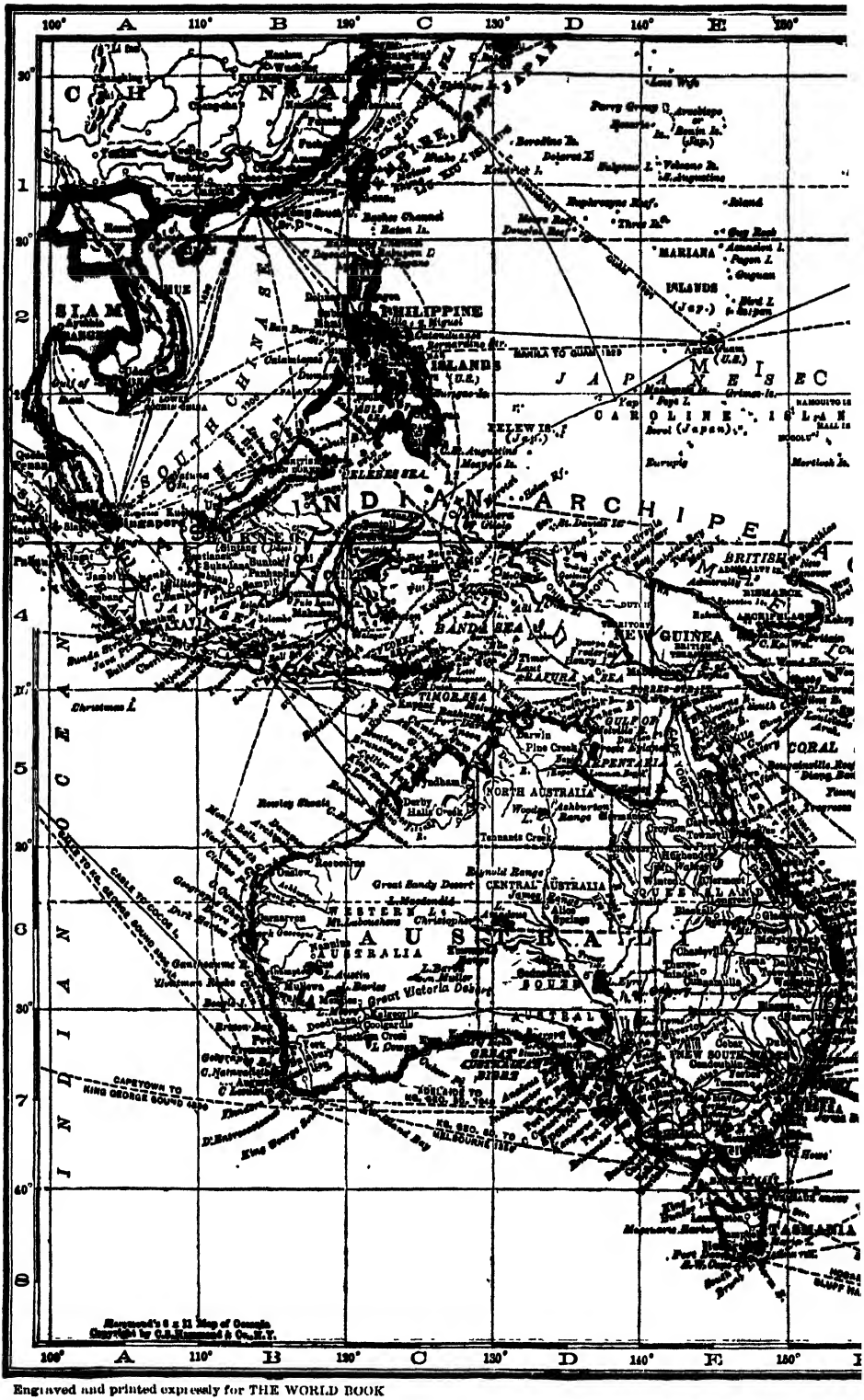
Samoan Islands. See SAMOA.

Society Islands, known also as TAHITI ARCHIPELAGO (pronounced *tah'-he te*), located in the South Pacific Ocean, and a colony of France since 1880. They lie directly east of Australia, about midway between that continent and South America, and are about 1,000 miles south of the equator. The total area of the group is about 650 square miles; the largest island is Tahiti, with 600 square miles; therefore it is evident that the others of the group are very small. The population is estimated at about

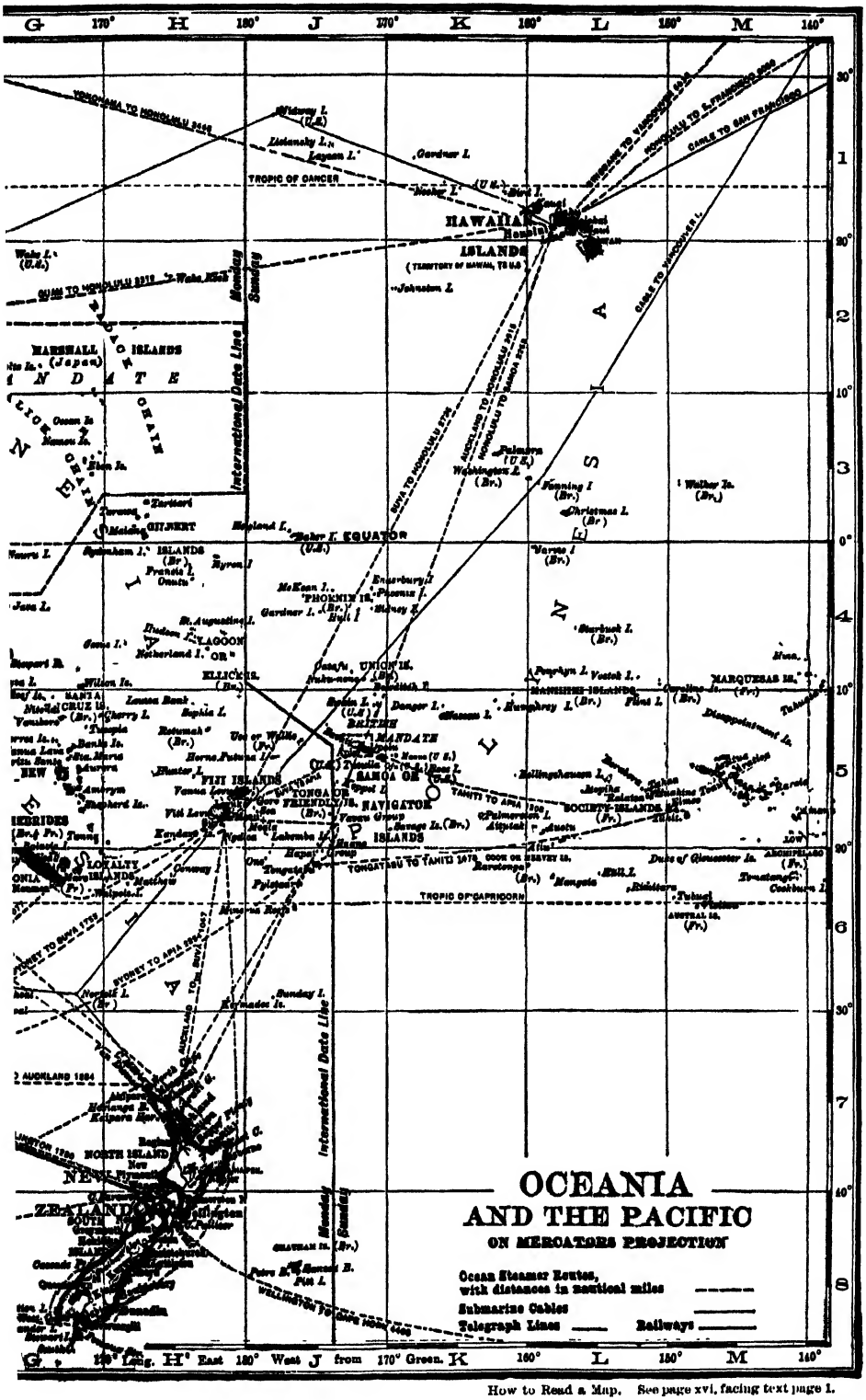
OCEANIA

NOTE: For cities and towns in Australia, Hawaii, Philippine Islands and New Zealand, consult indexes of individual maps of those countries.

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How to Read a Map. See page xvi, facing text page 1.

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10,000, and four-fifths of this number are on Tahiti. All tropical fruits grow in abundance. The chief town, and the capital of all French establishments, is Papeete, on Tahiti, with a population of about 4,600.

Solomon, a group of seven principal islands of volcanic origin, and smaller ones which are of coral formation. They lie slightly southeast of New Guinea, and are only a short distance from the New Britain Archipelago. The larger islands are very mountainous, the highest peak being 10,070 feet above the sea. This former German possession was mandated after the World War to Australia. The population of the entire group is about 175,000. The chief exports are copra, cocoa, and birds of paradise.

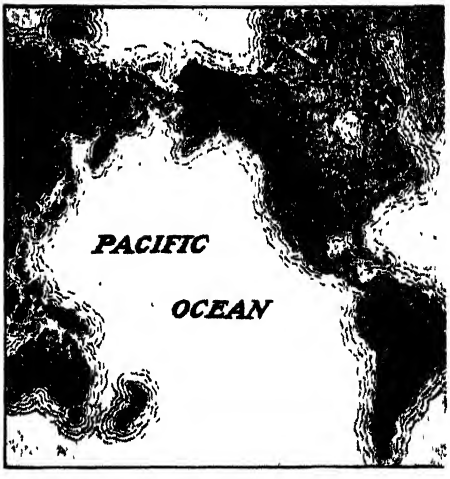
Tahiti. See *Society Islands*, above.

Tonga, also known as FRIENDLY ISLANDS, an archipelago lying near Fiji and Samoa, close to the International Date Line. In 1886 they were constituted a neutral kingdom, but four years later they passed to Great Britain as a protectorate, though the native kingdom is still recognized by the British. Of the population of the group, estimated at 23,750, all but about 750 are native Tongans. These are scattered over 390 square miles of territory, but half of the people live in one-third of that area. The Tongans are among the most civilized of the Polynesians. The name Friendly Islands was given by Captain James Cook (which see), who visited the archipelago in 1773 and 1777, and was cordially received by the natives. E.D.F.

PACIFIC OCEAN, the greatest of the oceans, a body of water so vast that it occupies more than a third of the entire area of our planet, and comprises about half its water surface. It lies between America and Asia and Australia, and sweeps from the Arctic on the north to the great ring of shoreless water known as the Southern (or Antarctic) Ocean. A happy accident gave it its poetic name. Moderate winds favored Magellan on his first cruise, and the name *Pacific*, which he chose to call this greatest of seas, records his own impression of its peaceful aspect. As a matter of fact, however, this ocean is not more free from storms than is the Atlantic.

The area of the Pacific has been estimated at about 71,000,000 square miles. It is broadest at the equator, where it measures 10,000 miles from east to west. Its greatest length from north to south is about 7,350 miles. Its depth is greater than that of the Atlantic, the average reading being about 2,530 fathoms (15,180 feet). The deepest place thus far discovered is near Mindanao, one of the Philippines, the soundings showing a depth there of 34,416 feet, or more than six miles. There are seven other known depths each of over 30,000 feet, and possibly the greatest depth remains yet to be discovered.

The bed of this ocean may be regarded as a sunken plain, dotted here and there, especially in its western part, with plateaus, volcanic islands, coral reefs, and atolls. Some of the plateaus emerge to form islands like Australia. The circulation of currents, which is produced by the action of the wind, is precisely similar



Thou wert before the Continents, before
The hollow heavens, which like another sea
Encircles them and thee, but whence thou wert,
And when thou wast created, is not known,
Antiquity was young when thou wast old.
—STODDARD: *Hymn to the Sea.*

to that in the Atlantic, but on a more imposing scale. The Japan Current corresponds to the Gulf Stream. In the South Pacific, the Humboldt Current, which flows northward along the west coast of South America, corresponds in a general way to the Benguela Current of West Africa, but the currents in this section are not well defined. The area of the trade winds is also less clearly defined than in the Atlantic. The northeast trade wind remains throughout the year within the northern hemisphere, but the southeast trade wind advances beyond the equator. In the China Sea, typhoons are frequent.

The American shore line is fairly regular, being broken by only one considerable gulf—that of California. On the west, it is much more uneven, being broken by the China Sea, Yellow Sea, Sea of Japan, Sea of Okhotsk, etc. Balboa discovered the Pacific in 1513 (see next pages). Magellan was the first European to sail across it (1520-1521). He was followed by such adventurers as Drake, Tasman, Bering, Anson, Cook, and Vancouver. R.H.W.

Related Subjects. For comparisons of the oceans, see the article OCEAN. The reader is also referred in these volumes to the following articles:

Atoll
Balboa, Vasco Nuñez de
Japan Current
Magellan, Ferdinand
Pacific Islands
Winds (with list)



(See page 5293)

BALBOA DISCOVERING

PACKERS AND STOCKYARDS ADMINISTRATION. See AGRICULTURE, UNITED STATES DEPARTMENT OF.

PACKING HOUSES. See MEAT AND MEAT PACKING.

PACTOLUS, *pak to' lus,* a river invested with a strange legend. See LYDIA.

PADDLEFISH, a family of fish consisting of two species, which have the snout expanded into a long blade. They are found in the fresh waters of China and of the Mississippi Valley. The American paddlefish inhabits the streams of the region between Texas and Louisiana on the south, and Minnesota and Wisconsin on the north. It has a smooth, greenish skin lacking in scales, and is of unusual size, an average specimen being three feet long and weighing thirty pounds; fish weighing up to 160 pounds are sometimes caught. With its paddle-like blade it stirs up the mud at the bottom of streams in search of food. Its flesh is sometimes smoked and sold as sturgeon, but it is the roe of the paddlefish that gives it its chief value, for from the eggs is made a good quality of caviar. The United States Bureau of Fisheries is attempting to keep the species from extermination. Paddlefish have much the same habits as catfish (which see), and are sometimes called *spoonbill cats.* L.H.

Scientific Name. The American paddlefish is known as *Polyodon spathula.* It is related to the sturgeon.

PADDY, rice enclosed in its hull. See RICE.

PADDY BIRD. See RICE (Enemies).

PADEREWSKI, *pah deh ref' ske,* IGNACE JAN (1860-), a Polish musician, one of the greatest pianists of all time. After achieving world-wide fame in his art, he temporarily abandoned it to devote his energies to the cause of Polish freedom during the World War period. On his resumption of his piano concerts, after a period of six years, Paderewski gave convincing proof that he was still a supreme master of that instrument. He was born in Podolia, Russian Poland, the son of a gentleman farmer. At the age of six, he began his piano lessons, and showed such promise that he entered the Warsaw Conservatory when twelve, to lay



From an old painting

THE PACIFIC OCEAN

the foundations of a great career. At sixteen he was giving concerts on tour, sometimes playing his own compositions, and at eighteen became a professor in the conservatory. About six years later, he was given a similar position in the Conservatory of Strassburg.



Photo Brown Bros

PADEREWSKI

Paderewski became a pupil of the famous Theodor Leschetizky (which see), in Vienna, in 1884, and three years later, began his brilliant career as a solo pianist. Successively, he played to enthusiastic audiences in Vienna, Paris, London, and the chief cities of America, and he amassed a great fortune within a few years In 1899 he married Baroness de Rosen, and afterward spent much of his time on his great Polish estate. After 1901 he appeared in public concerts but seldom, and then generally confined his playing to his own compositions. Among the best of these are the short compositions, *A Love Song* and *Night Song*. In 1902 his opera *Manru* was produced at the Metropolitan Opera House in New York, he himself conducting. It was very favorably received, but aroused no great enthusiasm among the critics. Of various other compositions, the *Minuet* is the most famous, in the opinion of most musicians.

Paderewski's devotion to Poland during the World War period is a part of modern history. He gave concerts to raise relief funds, helped enlist men for the Polish army, served as Premier of the new Polish republic, and represented his country at Versailles. Having depleted his fortune, he resumed his concert work in 1922, and again amazed his listeners by his marvelous technique and individuality of playing, in which there was a perfect combination of the emotional and the intellectual.

PADUA, *pad' u ah.* See ITALY (The Cities).

PADUCAH, *pah du' kah,* KY. See KENTUCKY (back of map).

PAGANINI, *pah gah ne' ne,* NICOLÒ (1784-1840), sometimes referred to in musical history as the greatest of all violinists, was born at Genoa, Italy. He received music lessons from his father before he was six years old, and later was taught by the best instructors in Genoa. In 1795 he went to Parma, Italy, to study, but the teachers there told him they could do nothing more for him. He then commenced a course of self-training so rigorous that he often played fifteen hours a day. In 1797 he began his concert tours, which, for many years, consisted of triumph after triumph. His playing of tender passages was so beautiful that his audiences often burst into tears, and yet he could perform with such force and velocity that at Vienna one listener became half crazed, and declared for some days that he had seen the Devil helping the violinist.



Photo: Brown Bros.

PAGANINI

Paganini's life, once his fame was established, was a combination of artistic triumphs and personal excesses. He earned large sums of money, but he indulged recklessly in gambling and other forms of dissipation, and on one occasion was obliged to pawn his violin. Having requested the loan of an instrument, that he might fulfill an engagement, he was presented with a fine Guarnerius violin by a French merchant of Leghorn, who refused to take it back after the concert was over. Always a favorite instrument with Paganini thereafter, it was bequeathed to the people of Genoa by the violinist, and is still carefully preserved in that city. Paganini's genius as a player overshadows his work as a composer. He left a number of compositions for stringed instruments, and these reveal his supreme mastery of technique.

PAGE, THOMAS NELSON (1853-1922), an American novelist, best known for his sympathetic and accurate portrayals of life in the South. He was born at Oakland Plantation, Va., of a family prominent in the history of the state. Both of his great-grandfathers were governors of Virginia, and one was a signer of the Declaration of Independence. After taking degrees at Washington and Lee University and University of Virginia Law School, Page practiced law for eighteen years in Richmond, Va. In 1893 he removed to Washington, D. C., where he began his long and successful literary career. From 1913 to 1919 he was ambassador to Italy.

Summary of His Work. *Marse Chan,* his first successful story, deals with a subject which is prominent in many of his tales —the affection between master and slave It was published with other tales, including *Meh Lady* and *Unc' Edinburg's Drowndn',* in a volume entitled *In Ole Virginia.* His best-known novels are *Red Rock, Gordon Keith, Bred in the Bone,* and *John Marvel, Assistant* Besides these, he wrote dialectic poetry and a number of essays, the latter dealing with the negro problem In 1921 he published a notable volume, *Italy and the World War* This is a highly valued work



THOMAS NELSON PAGE

PAGE, WALTER HINES (1855-1918), an American editor and diplomat, wartime ambassador of his country to Great Britain. He was born at Cary, N. C., educated at Randolph-Macon College and Johns Hopkins University, and after filling various positions as teacher, editor, and book-reviewer, he became editor and part owner of *The Forum* In 1895 he joined the publishing firm of Houghton, Mifflin Company as their literary adviser. In addition to this work, he was editor of *The Atlantic Monthly* from 1896 to 1899, when he resigned to become a partner in the publishing house of Doubleday, Page & Company (now Doubleday Doran)



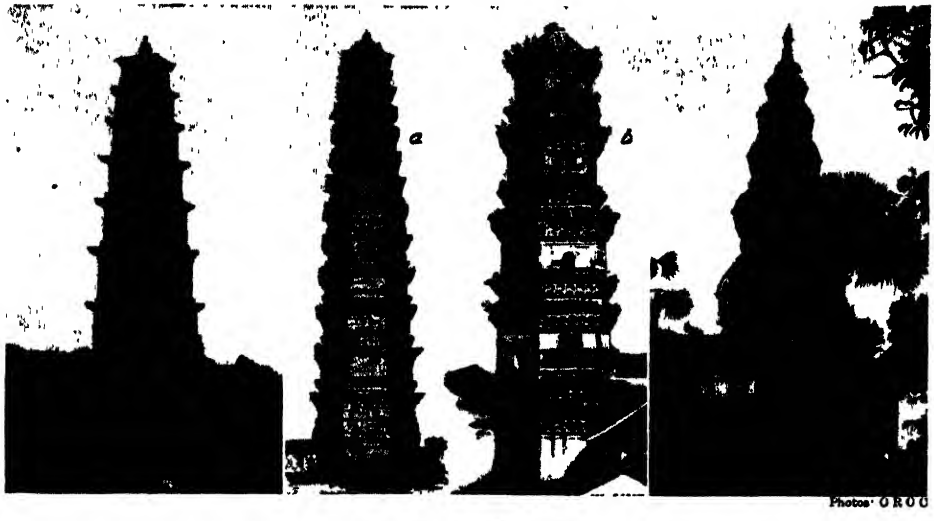
Photo Brown Bros

WALTER HINES PAGE

In 1900 Page founded *The World's Work,* and was its editor in chief until his appointment by President Wilson in 1913 as ambassador to Great Britain. This post he held for five years, ill health forcing his resignation. His *Life and Letters,* published after his death, was a valuable contribution to current history.

PAGLIACCI, I, *pahl yah' che e.* See OPERA (Some of the Famous Operas).

PAGODA, *pah go' dah* Everyone is familiar with Kipling's reference to the "old Moulmein Pagoda, lookin' eastward to the sea," in his poem *Mandalay.* In that city there are several



VARIOUS FORMS OF PAGODAS

(1) This has been standing for more than eighteen hundred years near the shore of the ocean in China. (2) *a*, built of glazed tile and porcelain, *b*, a typical form, with trees and shrubs growing on the successive roofs This structure is near Peking (3) A pagoda in Chiengmai, Siam.

hundred of these interesting many-sided towers, which in India are connected with the worship of Buddha. They are often of ornate design, and are good examples of Hindu architecture. The Hindu pagoda may be either an adjunct to the temple, designed for purposes of decoration, or it may be an independent shrine.

In China, where there are probably 2,000 of these towers, the pagoda is often a memorial building. The typical Chinese pagoda is an eight-sided structure of many stories, which have the peculiar curved roofs shown in the accompanying illustration. Brick, glazed tile, and porcelain are commonly used for building material. While not so ornate as the Hindu pagodas, they are often decorated with ivory, bone, and stone work. In some sections, the Chinese pagoda is as much a part of the landscape as the Dutch windmill in Holland. The Japanese also have pagodas, using them in connection with temple worship. They are usually built of wood.

PAGOPAGO, *pah' go pah' go.* See SAMOA.

PAHANG, *pah hang'*, one of the four governments of the Federated Malay States (which see).

PAIL MAIL, the origin of the street name *Pall Mall.* See CROQUET.

PAINE, THOMAS (1737-1809), a political and philosophical writer born in Norfolk, England. He attempted to earn a living as stay-maker, exciseman, preacher, and tobacconist, but on becoming acquainted with Benjamin Franklin, he was influenced to remove to America in 1774. While employed as editor of the *Pennsylvania Magazine*, in 1776, he became suddenly prominent through the publication of his pamphlet entitled *Common Sense*, in which he advocated complete independence for America and the establishment of a republican government. The reputation which he thus acquired grew with the publication, at intervals throughout the war, of a series of pamphlets called *The Crisis*. In 1777 he was made secretary to the Congressional Committee of Foreign Affairs, but was dismissed two years later for making use of diplomatic secrets in his writings. As a reward for services which he had performed, and that he might have leisure to devote himself to public affairs, he was given sums of money by Congress and by the state of Pennsylvania, and a farm at New Rochelle by the state of New York.



Photo. Brown Bros.

THOMAS PAINE

Paine went to Europe in 1787, spent some time in France, and then crossed to England. While there he published (1792) his *Rights of Man*, a reply to Burke's attack on the French Revolution. This made him exceedingly unpopular in England, but won him great favor in France, whither he had gone after the publication of the pamphlet, and

he was elected a member of the French National Convention. His opposition to the execution of Louis XVI offended the radical party in the Convention, and he was excluded from that body and imprisoned. During his imprisonment, he worked on the second part of his *Age of Reason*, the first part of which was published in London and Paris just after his arrest. On his release, he regained his seat in the Convention.

In 1802 Paine returned to the United States, but from that time on, he took little part in public affairs. While his early efforts in the patriotic cause won him the gratitude of the Americans, his attack on religion in *The Age of Reason* alienated many of them. This original and shrewd, but unscholarly, work was republished in 1912.

PAINT. We paint the exterior of our houses to protect them from the weather, and to improve their appearance, and we paint their interiors to make them more beautiful. Bridges, battleships, the steel pillars in great buildings, are all painted to preserve them from destruction through rust. The two great purposes for which paint is used are protection and ornamentation



Photo Keystone

THE PAINT-MAKER OF AGES AGO

Throughout France, Spain, Algeria, and Mexico, and in parts of South America caves have been found with paintings on the walls, dating back to unknown centuries. It has been established in the opinion of scientists that eight thousand years ago the Egyptians used paints made of mixed earths In the illustration, the primitive paint-grinder is reducing colors to powder and adding water from time to time

Paint consists of a coloring matter called a *pigment*, mixed with a liquid called a *vehicle*. Most pigments are mineral substances, such as white lead; zinc white; ocher, which consists of clay colored with an oxide of iron; the lead chromate and cadmium compounds, which are yellow; the lakes of various colors, consisting of some such mineral substance as clay colored with a dye; compounds of cobalt, which produce blue; and umber and sepia, which are brown. Carbon, in the form of lampblack or boneblack, forms the basis of black paints. Indigo comes from a plant, and cochineal, from which carmine is obtained, from an insect.

Linseed oil is the vehicle most widely used for oil paints (see OILS). The oil is usually heated to a high temperature, and a small quantity of lead oxide is added. The "boiled oil" thus produced dries quicker than the "raw", or unboiled. An oil paint contains a *solvent*, usually turpentine, to make the color spread easily, and a *drier*, usually a compound of lead and manganese, to hasten the drying process. Paints mixed with water are called *water-color* paints. They are used for decorating interiors. Usually, a small quantity of glue or dextrin is added to the mixture to make the paint stick.

Fireproof paint contains boric acid or powdered glass, which is melted by the heat and forms a protective glaze. Luminous paint contains some compound of phosphorus.

Not always is paint applied by hand. An example of a quicker process, where finest results are not necessary, is the custom of putting the initial coat of paint on railroad freight cars with a hose, through which the paint flows under pressure.

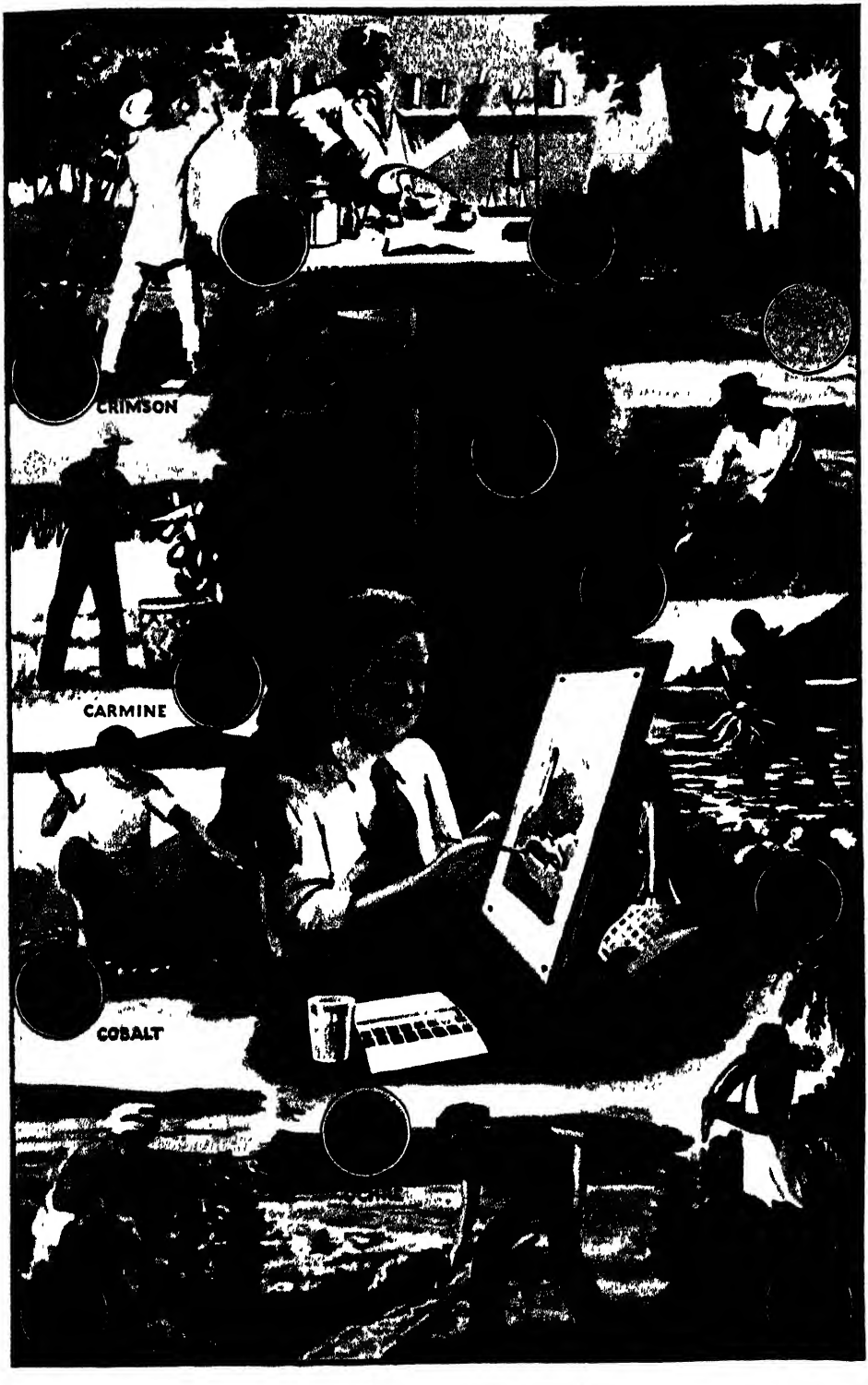
PAINTBRUSH, the name applied by botanists to about fifty species of the figwort family of plants. Most of them are native to the Western United States, chiefly of the Rocky Mountains region, but a few species are found in Asia. The paintbrush grows to heights up to about three feet, the average being probably a little less than two feet. The leaves are alternate, and the flowers, red, white, or yellow, are quite showy.

PAINTED DESERT. See ARIZONA (Scenic Wonders).

PAINTED PORCH, a school of philosophy. See ZENO.

PAINTED QUAIL, a name commonly applied in some sections of North America to the mountain quail. In Asia there is a distinct species bearing this name; it is a quail-like partridge, and it has a range from Ceylon north through India and east through China to Formosa Still another species, some darker in color, is found in Australia and the Philippine Islands.

PAINTED ROCKS. See WEST VIRGINIA (The Land).



THE SOURCES OF SOME OF OUR COMMON PIGMENTS



The STORY of PAINTING

PAINTING. We all love pictures for the pleasure and inspiration they give us An illustrated book is more attractive than one without illustrations, not alone because the pictures may clarify the text, but because they add an element of beauty which the writer cannot express in words. A picture, if it is a work of art, tells a story so that we feel it; that is, beauty is experienced through the emotions, more than through the senses of sight and hearing, and this is why a genuine work of art appeals so strongly to us. It seems to create a new atmosphere, in which, for the time, we live apart from the world of realities and care.

Some people can see beauty everywhere. They are conscious of it continually. The gift of such perfect instinct for beauty comes by nature to a few, it can, however, be cultivated by almost everyone, and a study of great pictures is especially helpful in fostering this instinct Many of us have overlooked the beauty that lies at our door until some great artist has found that beauty and has revealed it to us in a picture.

Painting concerns itself as much with the world of fancy as with the world of fact. In pictures by real artists, fact and fancy are so skilfully combined that none can tell where one ends and the other begins. "A picture is not really the representation of a thing, but the representation of the beauty of the thing, and when it expresses the soul of it, as it were, and not the mere lineaments, then, logically or illogically, art claims it as its child." The artist is more than a mere painter; he is one who "fits some beautiful conception with some beautiful expression." He is engrossed not only with form and color in themselves; his chief concern is to make these elements so express his ideal that it will live in the hearts of men All great painters have been more than masters of their art; they have been intellectual masters as well. Of Raphael, Whittier said—

> Around the mighty master came
> The marvels which his pencil wrought,
> Those miracles of power whose fame
> Is wide as human thought

Study of a Picture. Since concrete illustration is of far greater worth than mere verbal explanation, the reader who desires help in the study of pictures is asked to consider the following analysis of the *Song of the Lark*, by Breton, a reproduction of which is found on page 943. The plan should be studied with the picture before the reader.

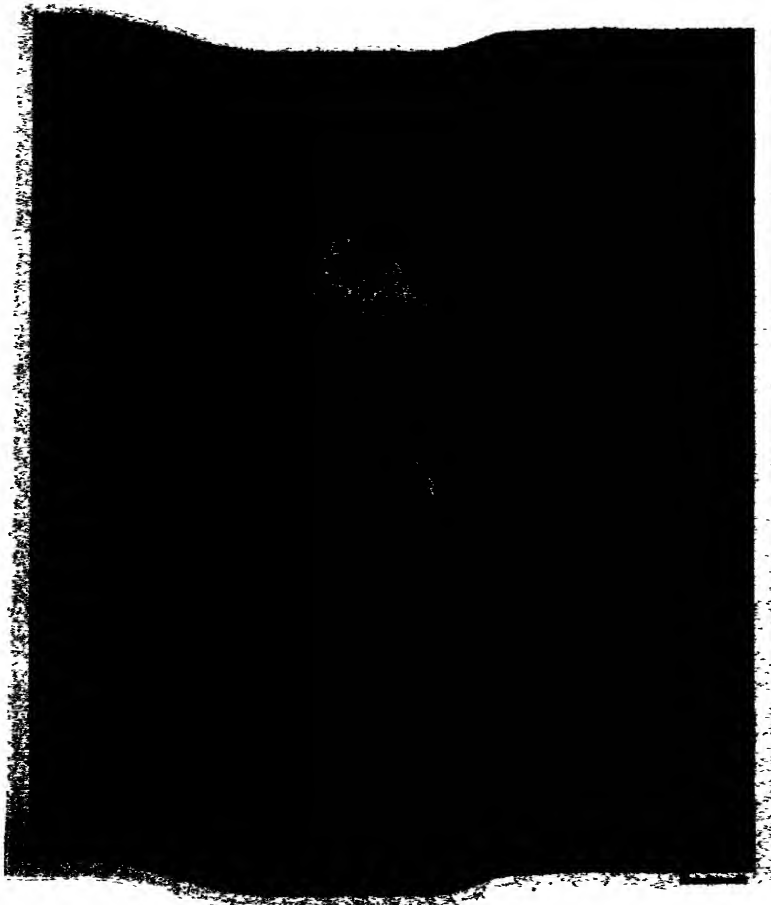
1 *The Theme* Day is dawning over the fields of Artois The rising sun is calling the laborers to the harvest field, and just as it appears above the horizon, this strong young peasant girl sets forth from her humble cottage to take her place in the ranks of the harvesters As she treads her solitary path in the soft morning light, a flood of melody bursts upon her ear. Enraptured, she pauses a moment and gazes upon the lark, whose heavenly message will lighten her heart during the long hours of toil. She is a simple country girl whose knowledge of nature has been derived from her contact with the fields and woods Responding to the message, she drinks in the beauty of the world about her, and seems to raise to heaven a silent hymn of praise for the mere ecstasy of living

> Musical cherub, soar, singing, away!
> Then when the gloaming comes,
> Low in the heather blooms
> Sweet will thy welcome and bed of love be!
> Emblem of happiness,
> Blest is thy dwelling place—
> O, to abide in the desert with thee!—Hogg.

2 *Composition* By composition is meant such an arrangement of the objects in the picture as will clearly and forcefully express the theme, or the artist's idea

The girl, silhouetted against the sky and field, is the dominating feature of the picture, but the lark is the center of interest. The hazy horizon and the soft light tell that the hour was at the break of day, and the entire setting is planned to lend emphasis to the bird and its morning song The depth of sky gives the effect of lofty flight; the houses in the background show that the girl has come from the village, and the foreground is a field of stubble from which the harvest has been gleaned.

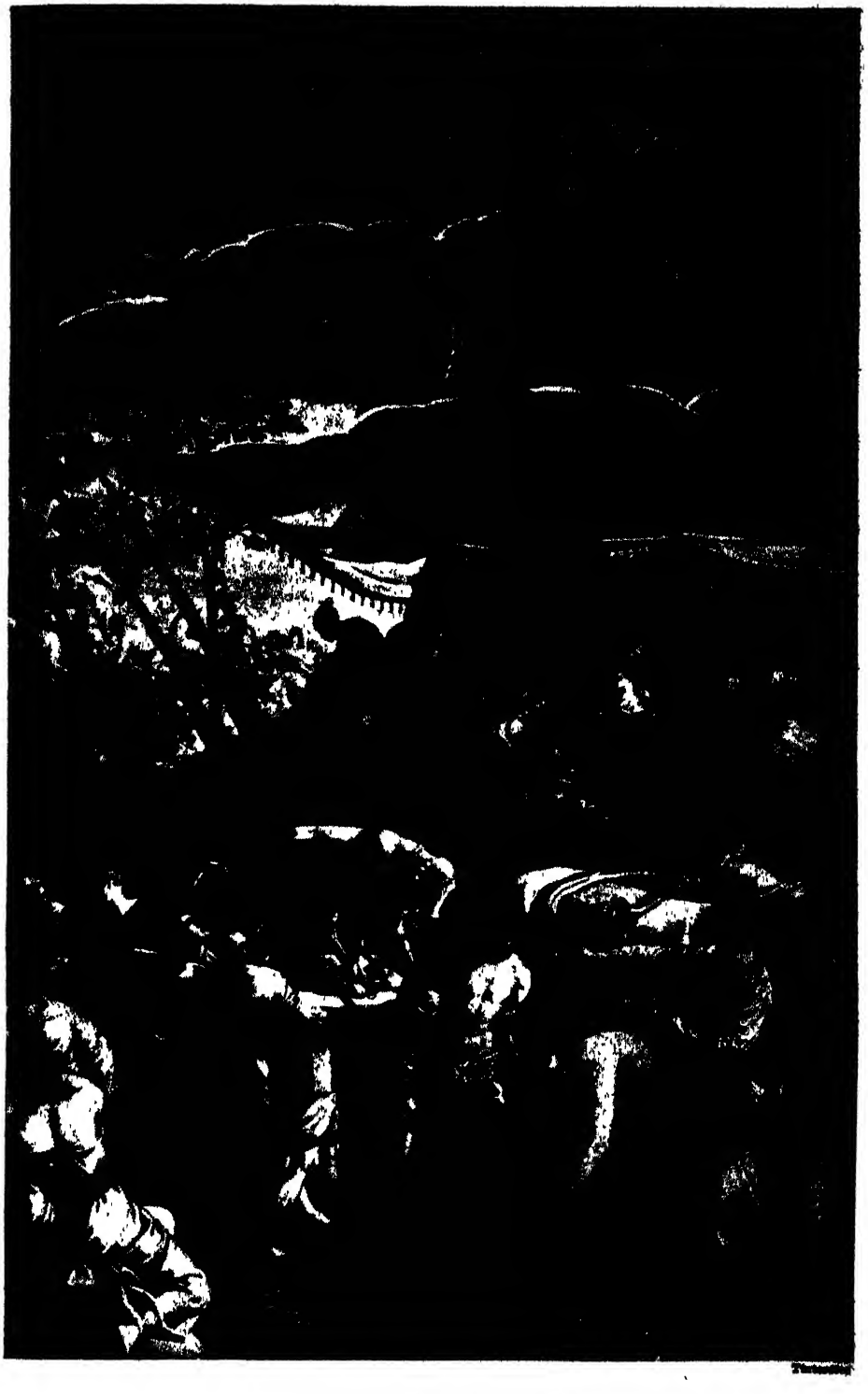
Every line of the figure of the girl is indicative of strength, endurance, and buoyancy. Though her task is long and hard, she is not overcome by it. Her countenance is expressive of hope and happiness, and, cheered by the song of the lark, she goes forward to her daily toil with a light heart. Notice the sim-



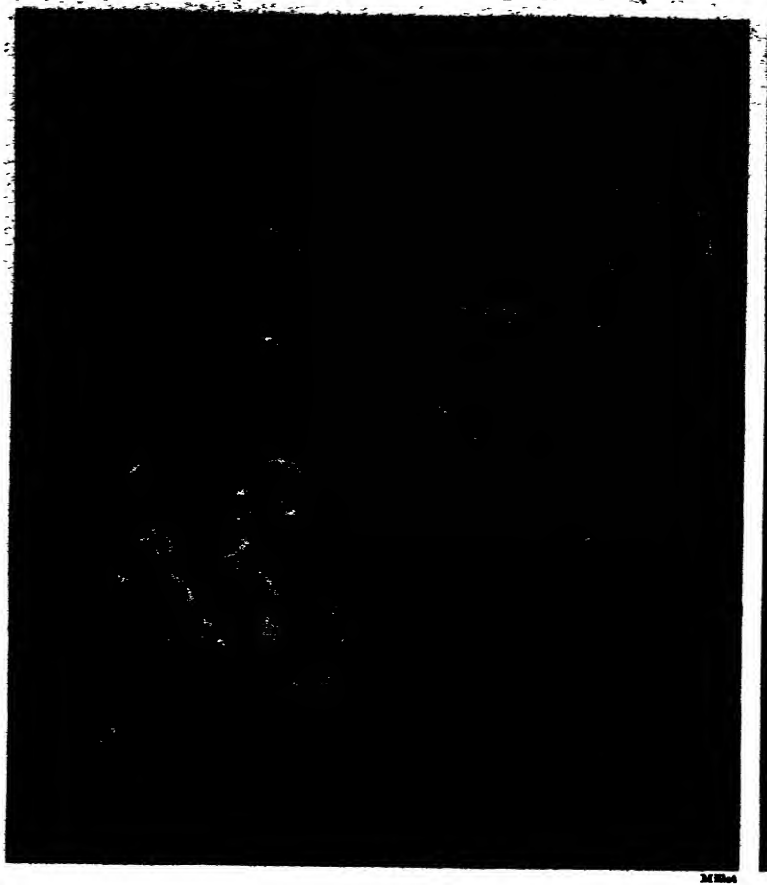
REMBRANDT LEANING ON A STONE SILL



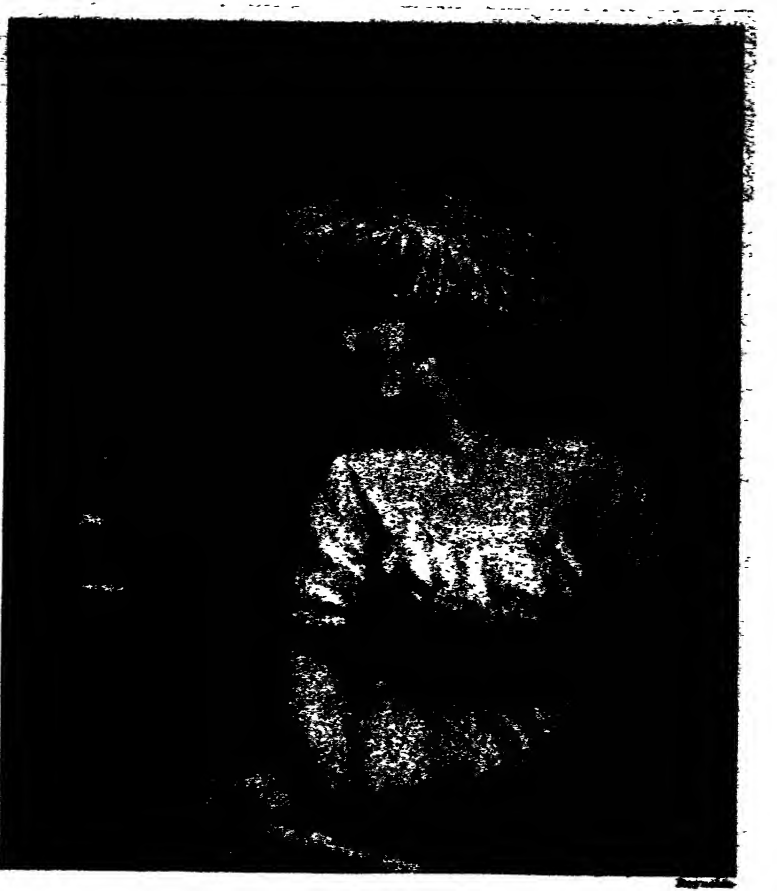
THE LAUGHING CAVALIER



THE WORSHIP OF THE GOLDEN CALF



FEEDING HER BIRDS



AGE OF INNOCENCE

TITLE	ARTIST	TIME	SCHOOL	GALLERY	SPECIAL NOTE
Age of Innocence	Reynolds	1723-1792	English	National Gallery, London	Few pictures of children have been more widely reproduced
Alice	Chase	1849-1916	American	Art Institute, Chicago	A charming portrait of a child
Angelus, The	Millet	1814-1875	Barbizon	Louvre	Millet's most popular painting. See ANGELUS.
Assumption of the Virgin	Titian	1477-1576	Venetian	Venetian Academy	One of the "twelve great paintings"
Aurora	Guido Reni	1575-1642	Bolognese	Rospigliosi Palace, Rome	One of the "twelve great paintings"
Avenue at Middelharnis	Hobbema	1638-1709	Dutch	National Gallery, London	This beautiful avenue of trees has become very familiar through reproduction.
Battle of Bunker Hill	Trumbull	1756-1843	American	Art Gallery, Yale	Of great historical rather than artistic interest
Beatrice Cenci	Guido Reni	1575-1642	Bolognese	Barberini Palace, Rome	One of the "twelve great paintings."
Blessed Damozel	Rossetti	1828-1882	English, Pre-Raphaelite	Privately owned	Portrait of the artist's wife.
Blue Boy	Gainsborough	1727-1788	English	Huntington Collection, San Gabriel, Calif.	A tall, manly boy, clad in blue satin
Bringing Home the Calf	Millet	1814-1875	Barbizon	Art Institute, Chicago	A realistic portrayal of a young calf and the mother cow
Broken Pitcher	Greuze	1725-1805	French	Louvre	No artist surpasses Greuze in portraying the delicate beauty of a young girl.
Carmencita	Sargent	1856-1925	American	Luxembourg	A portrait of the famous Spanish dancer.
Carnation Lily, Lily Rose	Sargent	1856-1925	American	Tate Gallery, London	An exquisitely colored picture of two little girls lighting lanterns in a garden
Charles I	Van Dyck	1599-1641	Flemish	Dresden Gallery	A dignified portrayal, which brings out the best in this unhappy king.
Chevy Chase	Landseer	1802-1873	English	Woburn. England	An action-filled picture of the hunt.
Children of Charles I	Van Dyck	1599-1641	Flemish	Berlin Museum	One of the world's masterpieces of child portraiture
Children of the Shell	Murillo	1617-1682	Spanish	Prado Museum, Madrid	John and the infant Jesus are painted with all the sympathy of this master.
Christ in the Temple	Hofmann	1824-1902	German	Dresden Gallery	Spiritual beauty marks the youthful Christ, the center of the group.
Coming Storm, The	Inness	1825-1894	American	Art Institute, Chicago	A fine example of the work of this "dean" of American landscape painters
Communion of St. Jerome	Domenichino	1581-1641	Italian	Vatican	One of the "twelve great paintings."
Creation of Man	Michelangelo	1475-1564	Florentine	Sistine Chapel, Vatican	A huge ceiling fresco, accounted one of the greatest works ever conceived.
Dance of the Nymphs	Corot	1796-1875	Barbizon	Louvre	Pale forms dance in the mists of early morning in this painting.
Dante's Dream	Rossetti	1828-1882	English	Walker, Liverpool	Probably the painter's masterpiece.
Deer Drinking	Bonheur	1822-1899	French	Public Library, New York	Vigor and dramatic effect mark this artist's animal paintings.

ONE HUNDRED OF THE WORLD'S FAMOUS PAINTINGS—*Continued*

TITLE	ARTIST	TIME	SCHOOL	GALLERY	SPECIAL NOTE
Descent from the Cross	Rembrandt	1606-1669	Dutch	Munich	Though many artists used this theme, Rembrandt's painting is thoroughly original.
Descent from the Cross	Rubens	1577-1640	Flemish	Antwerp Cathedral	One of the "twelve great paintings."
Descent from the Cross	Volterra	1509-1566	Italian	Trinita de Monti, Rome	One of the "twelve great paintings "
Distinguished Member of the Humane Society, A	Landseer	1802-1873	English	National Gallery, London	This Saint Bernard dog was a worthy subject, and Landseer did it full justice
Duchess of Devonshire	Reynolds	1723-1792	English	Devonshire House	An excellent example of the best school of English portrait painting
Feeding Her Birds	Millet	1814-1875	Barbizon	Lille Museum	Shows a peasant woman feeding her three children who sit on the doorstep.
Fighting Temeraire	Turner	1775-1851	English	National Gallery, London	Turner's most famous painting, notable for its light effects on the water.
Flight into Egypt	Rubens	1577-1640	Flemish	Louvre	A tiny canvas, one of Rubens' masterpieces
Flock of Sheep	Jacque	1813-1894	Barbizon	Louvre	Jacque was the great sheep painter of the Barbizon group.
Frieze of the Prophets	Sargent	1850-1925	American	Public Library, Boston	These mural decorations, ranking with the best in the world, are monumental types
Garden of the Hesperides	Leighton	1830-1896	English	Leeds Gallery	One of the artist's best works
Gleaners, The	Millet	1814-1875	Barbizon	Louvre	This realistic picture of hard-working peasants is one of Millet's best-known subjects
Golden Stairs	Burne-Jones	1833-1898	English	Privately owned	A group of beautiful young women descending a circular stair
Heads of Angels	Reynolds	1723-1792	English	National Gallery, London	These heads are really idealized portraits of children.
Holy Family	Murillo	1617-1682	Spanish	Louvre	Shows the same delicacy of treatment as the *Immaculate Conception*
Holy Night	Correggio	1494-1534	Parmese	Dresden Gallery	One of the "twelve great paintings "
Home of the Heron	Inness	1825-1894	American	Art Institute, Chicago	A study in the rich golden and orange tones that Inness loved so well
Hope	Watts	1817-1904	English	Walker, Liverpool	A graceful female figure, blindfolded, seated upon a globe
Horse Fair	Bonheur	1822-1899	French	Metropolitan Museum, New York	The most famous work of this great animal painter; a striking portrayal of struggle
Immaculate Conception	Murillo	1617-1682	Spanish	Louvre	One of the "twelve great paintings "
Interior of a Cottage	Israels	1824-1911	Dutch	Dordrecht Gallery	In the so-called *genre* painting, few have surpassed Israels
Isle of the Blessed	Boecklin	1827-1901	Swiss	National Gallery, Berlin	Shows the wonderful coloring so characteristic of this master
Joan of Arc	Bastien-Lepage	1848-1884	French	Metropolitan Museum, New York	The maid is shown with an inspired look, listening to the voices

ONE HUNDRED OF THE WORLD'S FAMOUS PAINTINGS—*Continued*

TITLE	ARTIST	TIME	SCHOOL	GALLERY	SPECIAL NOTE
John Alden and Priscilla	Boughton	1834-1905	American	Public Library New York	Illustrates Longfellow's *Courtship of Miles Standish.*
John the Baptist	Andrea del Sarto	1487-1531	Florentine	Cloister of the Scalzi Florence	Shows the Baptist when but a boy
La Belle Jardsnière	Raphael	1483-1520	Umbrian	Louvre	The name means *The Beautiful Gardener,* for the Madonna is shown in the midst of a garden.
Lake, The	Corot	1790-1875	Barbizon	Glasgow	One of the finest examples of Corot's art
Last Judgment	Michelangelo	1475-1564	Florentine	Sistine Chapel	One of the "twelve great paintings"
Last Supper	Da Vinci	1452-1519	Florentine	Santa Maria delle Grazie, Milan	One of the "twelve great paintings"
Laughing Cavalier	Hals	1584-1666	Dutch	Wallace Collection, London	The laughter is so infectious that the observer laughs, too
Leaving the Hills	Farquharson	1840-	English		A flock of sheep and their shepherd, coming down from the hills in the misty sunset
Lesson in Anatomy	Rembrandt	1609-1669	Dutch	Royal Museum, Hague	A realistic canvas showing young doctors watching the master surgeon
Light of the World	Hunt	1827-1910	English	Keble College, Oxford	A figure of the Christ bearing a lighted lantern and standing before a closed door
Look-Out, The	Homer	1836-1910	American	Boston Art Museum	A representative painting of this most characteristically American of all artists
Love and Death	Watts	1817-1904	English	Tate Gallery, London	Death forcing his way into a doorway, pushing Love to one side
Madame Le Brun and Her Daughter	Le Brun	1755-1842	French	Louvre	A flattering portrait of the artist and her young daughter
Madame Recamier	David	1748-1825	French	Louvre	The original of the excellent portrait was a famous leader of society in the time of Napoleon
Madonna of the Burgomaster Meyer	Holbein	1497-1543	German	Darmstadt Gallery	So called because Holbein introduced into his altarpiece portraits of the Burgomaster Meyer and his family
Madonna of the Chair	Raphael	1483-1520	Umbrian	Pitti Gallery Florence	Particularly notable because of the perfect way in which the figures are fitted to the circular space chosen
Madonna of the Grand Duke	Raphael	1483-1520	Umbrian	Pitti Gallery, Florence	One of the most beautiful of the Madonnas of this master painter
Mill, The	Ruysdael	1628-1682	Dutch	Dulwich Gallery, London	A windmill is the central figure of the landscape
Mona Lisa	Da Vinci	1452-1519	Florentine	Louvre	The inscrutable smile of this portrait has been the subject of endless dispute
Monarch of the Glen	Landseer	1802-1873	English	Privately owned	A picture of a great antlered stag, one of the best works of this famous animal painter

ONE HUNDRED OF THE WORLD'S FAMOUS PAINTINGS—*Continued*

TITLE	ARTIST	TIME	SCHOOL	GALLERY	SPECIAL NOTE
Napoleon at Fontainebleau	Delaroche	1797-1856	French	Leipzig Museum	This picture, like most of the works by this artist, shows great historical accuracy.
Night Watch, The	Rembrandt	1606-1669	Dutch	Rijks Museum, Amsterdam	Not in reality a night scene, but a change of the civic guard
Oxen Going to Work	Troyon	1810-1865	Barbizon	Louvre	Massive oxen are pictured as they tramp to work in the morning mists.
Penn's Treaty with the Indians	West	1738-1820	American	Independence Hall, Philadelphia	Shows Penn and the Indians under the great Shackamaxon elm, since blown down.
Pilgrims Going to Church	Boughton	1834-1905	American	Public Library, New York	This group of pilgrims on their pious journey through the snow is familiar through reproductions.
Plowing in the Nivernais	Bonheur	1822-1899	French	Luxembourg	Considered by many critics her best picture.
Pot of Basil	Alexander	1856-1915	American	Boston Museum	A striking picture, which has for its theme Keats' poem of *Isabella, or the Pot of Basil.*
Queen Louise	Richter	1823-1884	German	Cologne Museum	A beautiful actress dressed as Queen Louise posed for this portrait
Quest of the Holy Grail	Abbey	1852-1911	American	Public Library, Boston	A series of mural paintings, among the best ever painted on this subject.
Rain, Steam, and Speed	Turner	1775-1851	English	National Gallery, London	So suggestive is the painting that the observer can actually feel the rush through the rain.
Reading from Homer, A	Alma-Tadema	1836-1912	Dutch	Elkins Collection, Philadelphia	Reproduces with wonderful faithfulness the classic atmosphere.
Return of the Gleaners	Breton	1827-1906	French	Luxembourg	The most celebrated work of this painter of the fields.
Return to the Farm	Troyon	1810-1865	Barbizon	Louvre	A pastoral scene characteristic of this artist.
Sacred and Profane Love	Titian	1477-1576	Venetian	Borghese Gallery, Rome	The significance of this picture is not clear, but its beauty is undeniable.
Saint Anthony and the Christ Child	Murillo	1617-1682	Spanish	Seville Cathedral	One of Murillo's masterpieces, ranking with the *Immaculate Conception.*
Saint Sebastian	Guido Reni	1575-1642	Bolognese	Louvre	A fine figure, inspired with a powerful and dramatic sentiment.
Sheep: Spring	Mauve	1838-1888	Dutch	Metropolitan Museum, New York	The United States recognized the genius of Mauve before his own or any other European country appreciated him.
Shepherd of the Pyrenees	Bonheur	1822-1899	French	Condé Museum, Chantilly	Shows the shepherd's love for his flock, and at the same time, the artist's love for animals.
Sir Galahad	Watts	1817-1904	English	Eton College, England	Watts' first wife, Ellen Terry, was the original of this figure
Sistine Madonna	Raphael	1483-1520	Umbrian	Dresden Gallery	One of the "twelve great paintings."
Song of the Lark	Breton	1827-1906	French	Art Institute, Chicago	Rapture at the bird's song is reflected in the face of the peasant maid.

ONE HUNDRED OF THE WORLD'S FAMOUS PAINTINGS—*Continued*

TITLE	ARTIST	TIME	SCHOOL	GALLERY	SPECIAL NOTE
Sower, The	Millet	1814-1875	Barbizon	Vanderbilt Collection, New York	One of the finest of Millet's works, this pictures a sturdy peasant sowing grain
Spirit of '76	Willard		American		Popular for historic interest rather than for artistic merit.
Spring	Botticelli	1447-1515	Florentine	Florence Academy	This canvas breathes the very spirit of spring.
Surrender of Breda	Velasquez	1599-1660	Spanish	Prado, Madrid	One of the world's great historical paintings, frequently called *The Lances*, because of the weapons borne by the soldiers.
Transfiguration	Raphael	1483-1520	Umbrian	Vatican	One of the "twelve great paintings."
Tribute Money	Titian	1477-1576	Venetian	Dresden Gallery	A carefully finished painting of Christ and Judas.
Ulysses Deriding Polyphemus	Turner	1775-1851	English	National Gallery, London	An excellent example of this artist's use of shadowy figures and misty sunlight.
Washington	Stuart	1755-1828	American	Metropolitan Museum, New York	This unfinished work is regarded as the best portrait of Washington.
Washington Crossing the Delaware	Leutze	1816 1868	German	Metropolitan Museum, New York	It is the subject, rather than the artistic quality of this work, which has made it famous.
Whistler's Mother	Whistler	1834-1903	American	Louvre, Paris	Charming in subject, in composition, and in color.
Young Bull	Potter	1625-1654	Dutch	Royal Museum, Hague	Perhaps the most famous picture of cattle in the world.

REPRESENTATIVE PAINTINGS BY AMERICANS

TITLE	ARTIST	TIME	TYPE	WHERE EACH MAY BE VIEWED	SPECIAL NOTE
Anne	Bellows	1882-1925	Portrait	Art Institute, Chicago	Dignity of composition, vitality, and a zest for life distinguish Bellows' work.
Development of Civilization	Blashfield	1848-	Mural; Historic	Dome, Library of Congress	A fine example of Blashfield's talent as a decorative painter of large surfaces.
Fog Warning	Homer	1836-1910	Marine	Museum of Fine Arts, Boston	Winslow Homer is America's typical painter of the ocean in its varied aspects.
General Wolfe	West	1738-1820	Historic	Grosvenor Gallery, London	In this picture, the artist discarded the old convention of using Greek and Roman costumes.
Halt of the Wise Men	La Farge	1835-1910	Religious	Museum of Fine Arts, Boston	Representative of La Farge's religious paintings; has the spirit of the old masters.
Mary Stover	Copley	1737-1815	Portrait	Metropolitan Museum, New York	Some critics have named Copley "the American Van Dyck."





Velasquez (above) Botticelli (below)

THE SPINNERS

SPRING





THE SPINNERS

SPRING

distinguished from themes which are romantic, heroic, historic, or ideal]

Modern Painting. This division includes the period extending from the beginning of the eighteenth century to the present time. One of the most notable features of the modern period is the transition from religious and aristocratic themes to those of common life. We might truly say that, during the eighteenth century, art turned from autocracy to democracy. The great painters lived with the common people, from whom they obtained much of their inspiration.

English art boasts of no early history. Not until the eighteenth century do we find the first English interpreter of English life—William Hogarth. English painting really began with him, and from that time, developed very rapidly. Hogarth was followed by the eminent portrait painter, Sir Joshua Reynolds, and by Gainsborough. But Gainsborough excelled also as a landscape painter, and is now hailed as the first real interpreter of English rural scenery and English common life. From these we pass to J. M. W. Turner, "The Great Hermit of Nature," who was preeminent among the water-color artists of his day, and was one of the greatest landscape artists of all time The English are proud of their nineteenth-century painters, foremost among whom are Landseer, the animal story-teller of the Victorian Era, Lord Frederick Leighton, painter of classical subjects; Sir Laurence Alma-Tadema, who also revived classic art and specialized in old marble halls and balconies; Dante Gabriel Rossetti, William Holman Hunt, and Sir John Everett Millais, of the Pre-Raphaelites, Sir Edward Burne-Jones, the painter of the Golden Age; and George Frederick Watts, the painter of portraits and ideal studies of moral and religious significance.

France. France did not take first rank until the nineteenth century. During the reign of Louis XV, art and morals were at the lowest ebb. Painting was chiefly devoted to the decoration of the interiors of palaces for the king and members of his court, and it represented the voluptuous life of the time. With the beginning of the French Revolution, in the latter part of the eighteenth century, art became inspired by war and patriotism, with David as the great reformer. At first he turned his attention to classic subjects, but later devoted his efforts to the portraits of Revolutionary heroes. David and his followers adopted the classic style of painting, and it influenced French art throughout the century. In the nineteenth century, a new style of French art became prominent. Its themes were drawn from nature. Animals, landscapes, and scenes of common life were portrayed with lasting effect. Rosa Bonheur shared with Landseer the honor of being one of the two greatest animal painters of the age. The Barbizon School of Painting (see BARBIZON PAINTERS) arose and attracted the best artists of France. Rousseau, Diaz, Troyon, Jacque, Corot, and Millet either lived in the Barbizon region or came to it for fresh inspiration.

Other Nations. At the beginning of the nineteenth century, Cornelius, with Overbeck, Veit, and others, formed the association of Nazarene Painters, which had an important influence on German art. Cornelius also revived the long-neglected art of fresco painting. Kaulbach was his most noted pupil. Through the influence of Kaulbach and others, the stiff forms of the Nazarene painters were forgotten in the brilliant paintings of the best representatives of the modern school, among whom were Knaus, the Berlin genre painter; Max, the poet painter of Munich; Lenbach, who immortalized Bismarck in art; and Heinrich Hofmann, whose *Christ in the Temple*, in the Dresden Gallery, is one of the representative paintings of the modern school. Josef Israels brought again to Dutch painting the glory of the seventeenth-century period. In Spain, Sorolla painted wonderful landscape scenes, particularly pictures of the sea. The greatest representatives of Russian painting are Swedomsky, the historical painter; Verestchagin, whose war scenes are widely known; and Kramskoe, a painter of religious subjects.

Painting in the United States. Until the early part of the nineteenth century, art in America followed that in England. The first American artist of repute was John Singleton Copley, whose portraits of leading characters in New England history previous to the Revolutionary War are highly prized. Benjamin West, who attained distinction in London, was born in Pennsylvania, and for a time had a studio in Philadelphia. Gilbert Stuart attained distinction as a portrait painter, and his *Washington*, although unfinished, is considered to be the best likeness of the "Father of his Country." Among American landscape artists who have attained distinction are George Inness, whose works were exhibited at the Paris Expositions of 1867 and 1900; Bierstadt, whose *Yosemite* and other scenes of the Rocky Mountains have given him more than a national reputation; and Moran, whose *Grand Canyon of the Yellowstone* was placed in the Capitol at Washington. Trumbull, the foremost historical painter, is noted for his scenes of the Revolutionary War, four of which adorn the Capitol at Washington. John La Farge was the greatest of American decorators. Winslow Homer is noted for his sea scenes and fishes; Whistler, for his mystic creations and his portraits; Sargent, for his mural decorations and realistic portraits; and George Bellows, for the strength and boldness with which he treated both landscapes and figures.

The first great step toward the development of an American school of art was the founding of the American Academy of Design in New York in 1825. The art exhibit at the Centennial Exposition of Philadelphia in 1876 strikingly revealed the inferiority of American painting. It became the custom for American artists to study abroad—in Paris, Munich, and Rome. French, German, and Italian methods were introduced by these artists into the United States, and the Society of American Artists was founded in New York to perpetuate these ideals.

Several of the leading cities now have art schools of a high order of excellence. The collections in art museums and private galleries contain many works of rare merit, and the influence of these institutions, together with the instruction in art and its appreciation in the public schools, is gradually raising the public standard of art throughout the country.

Painting in Canada. Previous to the founding of the Royal Canadian Academy, in 1880, the best painters of the Dominion went abroad to study, and usually remained in France or England. Since the beginning of the present century, there has been a strong movement exerted in favor of Canadian art, and its influence is gaining strength throughout the Dominion. In 1907 the Canadian Art Club, including among its membership several prominent artists, was founded to promote present advanced tendencies. Among the best-known Canadian artists are Archibald Browne, Clarance Gagnon, William Hope, and Homer Watson. B.M.W.

Scattered throughout THE WORLD BOOK are dozens of reproductions of great paintings, placed with biographical material relating to artists of all countries and in all centuries.

Twelve Great Paintings. The following are usually listed by art critics as the world's twelve greatest paintings:

Assumption of the Virgin, by Titian; *Aurora*, by Guido Reni; *Beatrice Cenci*, by Guido Reni; *Communion of Saint Jerome*, by Domenichino; *Descent from the Cross*, by Rubens; *Descent from the Cross*, by Volterra; *Holy Night*, by Correggio; *Immaculate Conception*, by Murillo, *Last Judgment*, by Michelangelo, *Last Supper*, by Da Vinci, *Sistine Madonna*, by Raphael; *Transfiguration*, by Raphael

Related Subjects. The following biographies of famous artists and articles on more general topics will supplement admirably this discussion of painting

Abbey, Edwin Austin
Alexander, John W.
Allston, Washington
Alma-Tadema, Laurence
Angelico, Fra
Apelles
Bartolommeo, Fra
Bastien-Lepage, Jules
Bellini, Giovanni
Bierstadt, Albert
Blashfield, Edwin H.
Bonheur, Rosa
Botticelli, Sandro
Boughton, George H.
Brangwyn, Frank
Breton, Jules A.
Burne-Jones, Sir Edward
Caravaggio, Michelangelo M. da
Carracci
Copley, John S.
Cornelius, Peter von
Corot, Jean B. C.
Correggio
Crane, Walter
David, Jacques Louis
Domenichino
Doré, Paul Gustave
Dürer, Albrecht
Eyck, Hubert Van and Jan Van
Gainsborough, Thomas
Gelée, Claude
Gérôme, Jean Léon
Ghirlandajo
Giordano, Luca
Giorgione
Giotto
Guido of Arezzo
Guido Reni
Hals, Frans
Herrera, Francisco
Hobbema, Meindert
Hogarth, William
Holbein
Hunt, William Morris
Inness, George
Israels, Josef
Kaulbach, Wilhelm von
La Farge, John
Landseer, Sir Edwin H
Leighton, Frederick, Lord
Leutze, Emanuel
Lippi, Filippo
Meissonier, Jean L E
Memling, Hans
Michelangelo
Millais, Sir John Everett
Millet, Jean François
Munkacsy, Mihaly
Murillo, Bartolomé Esteban
Parrhasius
Parrish, Maxfield
Peale, Charles Wilson
Peale, Rembrandt
Perugino, Pietro Vannucci
Phillips, Coles
Poussin, Nicolas
Raphael Santi
Rembrandt
Remington, Frederic
Reynolds, Sir Joshua
Rossetti, Gabriel Charles Dante
Rubens, Peter Paul
Ruysdael, Jacob Van
Sargent, John Singer
Sarto, Andrea del
Schnorr von Karolsfeld, Julius
Steen, Jan
Stuart, Gilbert
Teniers, David
Tintoretto
Tissot, James Joseph Jacques
Titian
Turner, Joseph M W
Van Dyck, Anthony
Velasquez, Don Diego
Verestchagin, Vasili
Veronese, Paul
Vinci, Leonardo da
Watteau, Jean Antoine
Watts, George Frederick
West, Benjamin
Whistler, James A McN
Wilkie, Sir David
Zeuxis
Zorn, Anders

GENERAL ARTICLES

Angelus, The
Annunciation, The
Assumption in Art, subhead under Assumption, Feast of the
Barbizon Painters
Cartoon
Chiaroscuro
China Painting
Chrome
Corcoran Art Gallery
Cubist School of Painting
Foreshortening
Fresco
Holy Family
Impressionist School of Painting
Lake
Madonna and Her Babe
Nimbus
Ocher
Paint
Perspective
Ultramarine
Water Colors

PAISLEY, *payz' lie.* See SCOTLAND (The Cities).

PAKENHAM, *pak' en am,* SIR EDWARD MICHAEL (1778-1815), a British general killed in a battle which ought not to have been fought He was born in Ireland, entered the army, and became major general in 1812. While under Wellington in Spain, during the Peninsular War, he distinguished himself and did much to insure the success of British arms. Having been sent to America in the War of 1812, he took part in the attack on New Orleans, and was killed on January 8, 1815, two weeks after the treaty of peace was signed in Paris. Andrew Jackson opposed Pakenham in this battle. See WAR OF 1812 (Battles).

PALA. See CALIFORNIA, page 1094.

PALACE OF PEACE. See illustration, page 3004.

aggregate thickness of the stratified rocks of Paleozoic age is very great, and the era must have been very long. During it most of the major groups of animals seem to have originated, although some groups appear to have been rather highly developed at its beginning, and the earliest birds and mammals seem not to have appeared until after its close. Some groups of plants attained a high degree of development, but the flowering plants did not appear until later. L.LaF.

Related Subjects. The reader is referred in these volumes to the following articles

Cambrian Period	Mesozoic Era
Carboniferous Period	Ordovician Period
Devonian Period	Permian Epoch
Geology (Divisions of Time)	Proterozoic Era
	Silurian Period

PALE PRIMROSE. See COWSLIP

PALERMO, *pah lur' mo.* See SICILY (The Cities).

PALESTINE, *pal' es tin.* When one thinks of Palestine, or the HOLY LAND, as it is commonly called, it is nearly always in connection with the life of Jesus, who spent His earthly years entirely within its borders. That wonderful life is the crowning glory and chief distinction of this small country, which has been the melting pot of the deepest religious convictions of mankind. Many travelers have described the Holy Land. All see the barrenness, the unfulfilled possibility of greatness; some see racial poverty and wretchedness, boldly and harshly outlined; others remember the ancient glory of the Hebrews and their unfortunate later history.



LOCATION OF MODERN PALESTINE

There is gradually arising a new Palestine, toward which the hopes of the Hebrew world have been directed for a number of years. No longer is the country under the rule of the Turk, but as a new nation, guided by British administrative genius, both Arabs and Hebrews have an opportunity for progress.

Modern Palestine lies along the eastern shore of the Mediterranean Sea, south of the new Syria, west of Transjordania, and north of Hejaz, and has for part of its western boundary the Sinai Peninsula. The area of the country is about 9,000 square miles, and the population was estimated to be 882,000 in 1927

People and Cities. Of the people of Palestine, nearly 650,000 are Moslems, 148,000 are Jews, 77,000 are Christians. There are about 750 small Arab villages and numerous Arab tribes. Through the Zionist Movement (which see), the Jewish people all over the world have been encouraged once more to look toward Palestine as their national home There are now more than one hundred settlements of Jews in Judea, Samaria, and Upper and Lower Galilee. The Arab population has also increased Immigration is limited in numbers by the administration's policy; only such a number as the developing industrial and agricultural opportunities can absorb are admitted

The mixed population necessitates three official languages, English, Arabic, and Hebrew. The government maintains about 300 schools, which provide chiefly for the illiterate Moslem population, as well as a teacher-training school, a technical school, and a law school. Nearly 200 schools for Christians are maintained by religious organizations, and the Zionist organization, with other Jewish bodies, conducts more than 250 schools for Jews, including secondary schools in Jerusalem, Tel-Aviv, and Haifa, music schools, an agricultural school for women, an Arts and Crafts Institute, and a technical college A Hebrew University at Jerusalem was opened in 1925.

A spirit of cooperation between the Arabs and the Hebrews seems impossible. There have been several clashes between these races Each group has resented the presence of the other—the Arabs because they felt that the British promise to help build up a Jewish national state in Palestine ignored their own rights there; and the Hebrews because they felt that the Arabs were receiving an undue proportion of help from the administration, while world organizations of Jews assumed the burden of their own aid in education and settlement.

The Cities. Ancient towns which are now only of historical interest are the following:

Acre, *ah' kur* or *a' kur,* or **Akka,** a city of great antiquity at the foot of Mount Carmel In medieval times, it was a place of great importance, being the key to the Holy Land, and in consequence it is famous for many sieges and underwent frequent destruction. In 1104 it was taken by the Crusaders



Photos: P & A; OROC

In Rural Palestine To-Day. The ancient land is largely arid, though irrigation is slowly reclaiming it. Here is an illustration of a Bedouin village at the foot of Mount Hermon, not many miles from Jerusalem. The inset presents a thrashing scene; oxen pull a sled weighted with stones over the grain.



Photo OROC

PRESENT-DAY VIEW OF BETHLEHEM FROM THE JERUSALEM ROAD

(see CRUSADES). In 1187 the Saracens recaptured it, but it was recovered by Richard Coeur de Lion, who gave it to the Knights of Saint John of Jerusalem In 1291 it was again taken by the Saracens. Napoleon attempted unsuccessfully to take Acre in 1799, when he was approaching the height of his wonderful career. Little of interest now remains Even the harbor, once a noted seaport of Syria, is declining in importance; the city's population is about 6,000.

Beersheba, *be ur she' bah,* a city of the Promised Land of the Hebrews, associated with the life of Abraham, Isaac, Esau, and Joseph Its position in the extreme south of Palestine, the full length of the country from the city of Dan, led to the expression "from Dan to Beersheba," now a sort of slang phrase meaning within the outermost limitations. The ancient city is now but a heap of ruins. The name means *well of the oath,* so called because there Abraham made a covenant with Abimelech. A new town of about 1,600 inhabitants lies southwest of the old site.

Bethel, the place where Abraham pitched his tent, where Jacob saw in his dream the ladder reaching to heaven, upon which angels were ascending and descending, and where he wrestled with the angel, and had his name changed to Israel. There are various opinions about the location of Bethel, but most authorities consider it to be about twelve miles north of Jerusalem. The name means *house of God.* The present town of Beitin is of no importance.

Bethlehem, *beth' le hem,* the town in which Jesus Christ was born. The name means *house of bread.* Bethlehem is now the small, insignificant village of Beit Lahm, about five miles from Jerusalem, with but one street of low, flat-roofed houses. In this Christian village, churches, orphanages, and religious institutions seem to predominate. The Basilica of the Nativity, originally built by the Emperor Constantine in A.D. 330, although it has undergone many changes and alterations, is the oldest Christian church still in use. It covers the supposed site of the "manger" in which Christ was born.

Hebron, in the hilly country of Judah, about nineteen miles southwest of Jerusalem, is one of the oldest towns in the world which is still inhabited. It existed as early as the days of Abraham, for his wife, Sarah, died there, and he purchased the cave of Machpelah from the Hittites for her sepulcher In the present town, which is called EL-KHALIL, stands a great mosque named El-Haram Within the walls of this mosque is a cave, supposed to be the ancient sepulcher in which not only Sarah, but also Abraham, Isaac, Jacob, and Rebecca, were buried. It was in Hebron that David was crowned king of Israel, and he reigned there for seven years The present town, located 3,040 feet above sea level, has a population of nearly 20,000, principally Mussulmans. The terraced slopes surrounding the place are noted for their luxuriant vineyards.

Jericho, *jair' ih ko,* an ancient city of Palestine, whose strongly fortified walls, according to the Bible story, fell at the shout of the Israelites, after they had marched around the city for seven days by divine direction, under the leadership of Joshua (*Joshua* VI, 20). Because of the amount of spoils recorded, the city was long reported to be very rich, and accounts of recent excavations prove this supposition to be true Although much of the city was destroyed by the Israelites, it was later rebuilt. The history of Jericho is that of repeated destruction and plunderings It is chiefly remembered in connection with a number of prophets, including Elisha. After it had been plundered by the Romans, Herod the Great rebuilt and beautified the city, erecting a royal palace on the hill behind the city, but to-day all that remains is a small village named Er-Riha, noted for its fruit. Of ancient Jericho itself, only a pool and the fragment of a wall remain.

Nazareth, a town in ancient Galilee, where Jesus spent his early youth. It was a small town, because of the limited water supply; there was but one spring in the entire village. There is no mention of Nazareth in the Old Testament, which proves that the town was little known, and Nathanael expressed the general contempt and depreciation of the time when he asked, "Can there any good thing come out of Nazareth?" (*John* I, 46).

For some centuries after Christ, Nazareth continued to be obscure, but about A.D. 600, it became a place of pilgrimage. The present town, called En-Nasira, has a population of approximately 8,000—



Photos: Wide World; O R O G

Scenes from the Holy Land. At left, the main street of modern Bethlehem; at the lower right, outside the walls of that historic town. At right, above, a view of Acre as it appears to-day, nestling on the Mediterranean, on the Bay of Acre.

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far in excess of that of Biblical times—and contains the Latin Church of the Annunciation, on the supposed site of Mary's house, one of the most famous pilgrim shrines in Palestine To the Virgin's Well, the spring existing in Bible times, the women still come with tall jars balanced on their heads, as they have done for centuries.

Samaria, the capital of the northern kingdom of Israel during the reigns of the later kings. It was built by Omri, in the ninth century B C , and named for the original owner of the site, Shemer (*I Kings* XVI, 24). Samaria was captured by the Assyrians about 722 B C., and the region was repopulated with immigrants from the east, who were thereafter known as Samaritans After a long and troubled history, the town was given by the Emperor Augustus to Herod the Great, who named it Sebaste, and rebuilt it on a magnificent scale It survives at the present day in the small village of Sebastiyeh The original Samaria is now but an enormous mound of debris

Cities of Palestine which have present-day significance are few. Acre and Gaza (population, 17,000) are ports of minor importance. Jerusalem, the capital, is described in these volumes under its title. Haifa and Jaffa, the chief ports, are noted below:

Haifa, with the best natural harbor on the coast, is destined to grow in importance because of the administration's plans for harbor improvement. It is on the Bay of Acre, at the foot of Mount Carmel, the site of the ancient Sycaminum, but the present city is modern Its population numbers about 25,000, its chief exports are grain and oil



Photo OROC

TWO GIRLS OF MODERN NAZARETH

Returning from Mary's Well with filled water jars, which they have little difficulty in balancing gracefully on their heads

Jaffa, *yah' fah,* or **Yafa,** one of Palestine's seaports on the Mediterranean There is railroad connection with Jerusalem, which lies thirty-five miles southeast, and Jaffa is therefore the chief port of entrance for tourists to the Holy Land. Although the narrow entrance of the harbor is skirted by dangerous reefs, and passage is often impossible, trade is important, and quantities of fruits, wool, wine, oils, soaps, and sesame are exported The city, as seen from the sea, is a conical hill of sparkling color, reaching into the cloudless Syrian sky in two minarets, with a bold slope toward the sea. The population is estimated at over 45,000. The suburb of Tel-Aviv is now larger than Jaffa proper, and is modern, with paved streets, pure water, sewers, electricity, and costly residences, largely a result of Jewish enterprise.

As ancient Joppa of Phoenicia, Jaffa was the seaport of Jerusalem; through it the timber from Lebanon and other riches of Solomon were imported. It was the port from which Jonah departed for Tarshish, and the city in which Dorcas lived, and here it was revealed to the Apostle Peter that Christianity was for all the world.

The Land. Centuries ago this whole section was covered by the waters of the Mediterranean. In the course of time, a portion of the land, about thirty-five miles wide in the north and 100 miles wide in the south, was raised above sea level. On the opposite side, in the east, the land tipped down toward the west, and in the lowest part was the Jordan River, fed by the springs in the Lebanon Mountains, and emptying into the Dead Sea, at the south. This explains why this sea, and the Sea of Galilee, which is also in the course of the Jordan, are below sea level. The Dead Sea has no outlet and is very salt. The Sea of Galilee, on the contrary, is fresh and contains many fish.

West of the Jordan, and extending north and south, runs a long chain of rugged hills, wooded in places by oak, cedar, ash, sycamore, and oleander trees. In the north, just below the Mountains of Lebanon, which rise to a height of 9,000 feet in Mount Hermon, lies the plain of Esdraelon. Stretching along the whole coastal region is the plain of Sharon. In the south the mountains called Judean Hills slope gently westward toward the sea. In this section, which is the most fertile part of Palestine, grains and grapes, figs, olives, and apricots are raised in abundance. The descent on the eastern slopes of the hills is very rapid, and much of this rough country is a wilderness.

There are two seasons in Palestine, summer and winter. The winter season, which is

moderately cold and rainy, lasts from November until April. The summer is dry and, especially in the inland villages east of the coast plains, very hot. The country marks the southern limit of the milder temperatures and the northern limit of tropical climates, and its many wild flowers are typical of both. Flowering almonds, azaleas, acacias, the scarlet anemone, the narcissus, and the crocus are abundant.



Photo Keystone

JAFFA, AS SEEN FROM THE SEA

Resources and Development Palestine is an agricultural country, in the climate of its coastal plain and inland valleys, it closely resembles Southern California, and is considered to have similar possibilities of development. Irrigation is a great aid to increased production; mosquito-infested swamps are being drained, and the water of the springs is being conserved for the crops. In many cases, the drainage reveals submerged aqueducts and reservoirs of the Roman time, neglected during the centuries of the Moslem régime

Cereals, olives, figs, grapes, cotton, and tobacco are grown The administration is encouraging reforestation, has planted about 5,000,000 trees, and is taking measures to protect young trees from grazing animals.

Minerals found in commercial quantities are limestone, sandstone, gypsum, rock salt, and sulphur. Enormous quantities of chemical salts, estimated to be worth several hundred billion dollars, are available in the waters of the Dead Sea. Mineral-oil deposits have not yet been developed. Hydroelectric development has been begun by Jews in the Jordan Valley, around the Sea of Galilee. Further utilization of this power will increase the industrial enterprises, which now consist of flour mills, soap, brick and tile factories, oil mills, and wine presses. The country exports soap, oranges, watermelons, raw wool, wine, almonds, hides, and skins. Its chief imports include cotton fabrics, flour, cement, sugar, timber, motor cars and machinery, and cigarettes.



Photo OROC

A BEDOUIN BEARER OF BURDENS

Palestine has nearly 800 miles of railway, all owned by the government. Public highways are about 600 miles in length, and nearly 400 miles are hard-surfaced. All of this development, however, exists side by side with methods as old as the ancient country itself—in agriculture, industry, and transportation.

Government. Palestine is administered by Great Britain under a mandate given by the League of Nations in 1922; it is under "Class A" of mandated territories A constitution adopted in 1922 provides for a High Commissioner representing Great Britain, a commander in chief, and a representative Legislative Council, consisting of twenty-two members. Every male citizen over twenty-five years of age may vote. There is a Supreme Moslem Council to control matters connected with the Moslem religion. A Jewish National Committee represents the Jewish population in dealing with the administration.

History. In Old Testament times, the country was known as *Canaan* and *Philistia*, and was inhabited by Canaanites and Philistines, Palestine being the Philistine name of the southern part of Canaan. For long ages, Palestine was the home of the Hebrew race, but it was under control of Rome in the time of Christ. In the seventh century, it passed under the Moslem power, and from 1516 to 1919 was in the hands of the Turks, a part of the Turkish Empire. Great was the joy of all Christen-



Photo: OROC

ONE MAY ASK, "WHAT IS TIME TO AN ORIENTAL?"
Arabs of Palestine sit by the side of the road, probably engaged in the discussion of the gossip of their village This is a present-day picture

dom when, during the World War, General Allenby of the British forces drove the Turkish power from Jerusalem and out of Palestine. Now, under an orderly, progressive government, the country is advancing toward a national entity and independence. One evidence of this is the adoption of a separate currency system to replace the Egyptian currency formerly in use.

Earthquakes in 1927 in Asia Minor killed 200 people and injured 700 more in Palestine. Much damage was done, particularly in Jerusalem.

Related Subjects. The reader is referred in these volumes to the following subjects.

Allenby, Edmund	Jews
Canaanites	Jordan River
Crusades	Judea
Dead Sea	Lebanon, Mountains of
Galilee	Mandated Territories
Gethsemane	Olives, Mount of
Jerusalem	World War
Jesus Christ	Zionist Movement

PALESTINE, TEX. See TEXAS (back of map).

PALESTRINA, *pah lays tre' nah,* GIOVANNI PIERLUIGI DA (1526-1594), an Italian composer, the first great musical genius. His real name was GIOVANNI PIERLUIGI, but he is called Palestrina from the town of his birth, located not far from Rome. Much has been surmised, but little is known, of his early musical training, though he probably studied several years in Rome. Between 1544 and 1551, he acted as chapelmaster in the cathedral of his native town. In 1551, on the accession of Pope Julius III, previously bishop at Palestrina, the young musician was appointed music director of the Giulia Chapel of Saint Peter's in the Vatican. Three years later, Palestrina dedicated his *First Book of Masses* to the Pope, and in January, 1555, his great patron had him enrolled as a singer in the Sistine Chapel. This appointment was confirmed by Marcellus II, the next pontiff, but was disapproved by Pope Paul IV, who succeeded Marcellus after twenty-three days. Because Palestrina was a layman, that is, married, Pope Paul dismissed him with a small pension.

After a serious illness caused by this rebuff, Palestrina became chapelmaster in the Church of Saint John Lateran, in Rome, remaining there for over five years. Then, for ten years, he held a similar position at Santa Maria Maggiore (1561-1571). In 1564 the reigning Pope, Pius IV, appointed a commission of eight cardinals to consider the improvement of church music. Invited by two of the committee to submit music that would be free of current abuses, Palestrina tendered three masses, of which the *Mass of Pope Marcellus* was accepted as a model of purity of style. This great composition is so beautiful and dignified that all Roman Catholic masses have since been patterned after it. Pope Pius gave the musician the title of "Composer to the Pontifical Chapel," and, in 1571, restored him to his former position as director of music in the Giulia Chapel. Here he remained until his death.

While some authorities have rejected the traditional account of the incident related above, it is generally agreed that Palestrina saved church music by submitting a noble and spiritual composition at a time when the church

heads were on the point of retaining only the liturgical chant. He composed, in all, ninety-three masses, and in them he gave expression to the highest ideals of the school of which he was preeminently the leader.

PALIMPSEST, *pal' imp sest.* See MANUSCRIPTS.

PALISADES, a series of massive cliffs forming one of the most picturesque features of the scenic beauty of the lower Hudson River. For the most part, these precipitous bluffs rise almost directly from the water's edge to an elevation of from 200 to 550 feet, and extend along the west bank of Haverstraw Bay, thirty-two miles north of New York City, south to Weehawken, N. J., a distance of about thirty miles. These bluffs consist of basaltic trap rock, and exhibit marked columnar effects, which greatly add to the natural beauty and interest of this portion of the Hudson River district.

About 35,000 acres in the vicinity have been set aside as the Palisades Interstate Park, located partly in New Jersey and partly in New York, and extending north to Bear Mountain, one of the most picturesque points in the region. The park, which will ultimately cost about $8,000,000, is under the control of the Palisades Park Commission. Included in this area is a tract of 10,000 acres in Orange and Rockland counties (New York), the gift of Mrs. Edward H Harriman, who also donated $1,000,000 for the project. As generous privileges are granted by the park commissioners for camping and picnics during the summer, the grounds are visited and enjoyed by thousands of people from the neighboring cities and towns. See illustration, NEW YORK (state); HUDSON RIVER; and page 5318.

PALISSY, *pah le se',* BERNARD (1510-1589), a famous French potter and one of the most versatile men of his day. His fame now rests chiefly on his enameled pottery, but he was also a scientist and philosopher, a pioneer in the field of geological and chemical research, a theorist on agricultural improvements, the author of several books on art subjects, and an outstanding example of the ultimate triumph of patience over obstacles that appear almost insurmountable.

The locality of his birth is uncertain; some authorities give it as Saintes, and others place it near Agen. As a youth he was apprenticed to a stained-glass painter, and also was trained to practice land-surveying. Passionately fond of acquiring knowledge and gifted with keen powers of observation, he turned to good profit the ten years of wandering through the French provinces which followed his apprenticeship days.

He supported himself and family as a glass painter until 1542, when the chance sight of a curious cup of foreign origin and made of an unknown substance decided his career. So impressed was he by the beauty of the enameled piece that he determined to discover the secret of its composition and to produce pieces of equal beauty. In his *Memoirs* he gives no description beyond the statement that the paste was a kind of "white enamel."

For almost sixteen years, Palissy worked doggedly on experiments which exhausted his resources. At the lowest ebb of his fortune, he was forced to burn up the furniture and even the flooring of his house to provide fuel for the furnace. Although he was destined never to discover the secret of the pottery for which he had sacrificed so much, his experiments had made him efficient in all things connected with the manufacture of pottery, and led to the production of earthenware vessels of great originality of design, brilliance of color, and perfection of workmanship, surpassing anything that had as yet been achieved. Adequate reward for his years of obstinate struggle came in 1557, when his work was purchased by the queen mother, Catharine de' Medici, and by the nobles of the court. So popular did his smaller pieces in pottery become that he found no difficulty in selling them for great sums.

For years Palissy had been an avowed Huguenot, and his plain speaking about the reformed religion did not pass unnoticed by the religious authorities. In 1561 he was arrested and imprisoned at Bordeaux, but at the intercession of his noblemen friends, he was released and given an appointment as potter to the queen. Palissy then located in Paris, and he was permitted to erect his oven and workshop in the royal garden of the Tuileries, where he enjoyed the patronage of King Henry III Fame and fortune were now his, and he devoted himself assiduously to art, as well as to scientific pursuits. His scientific lectures aroused great interest.

But in the end his success and happiness forsook him. His patrons were not powerful enough again to rescue him from the persecutions against his co-religionists. In 1589 he was arrested and thrown into the Bastille, where he died.

PALK, *pawk*, STRAIT. See CEYLON.

PALLADINO, *pahl ah de' no,* EUSAPIA. See SPIRITUALISM.

PALLADIUM, a statue of Pallas Athene, made of olive wood, said in the Greek myths to have fallen from heaven and to have assured safety to the city of Troy as long as it was preserved there. During the Trojan War, Ulysses and Diomedes undertook to carry away the image. They went secretly at night, and Ulysses, who lifted up his companion so that he could climb over the walls, was unable to get in himself, as Diomedes refused to assist him. When they were returning in safety,



Photo Keystone

Palisades of the Hudson. The precipitous cliffs on the west bank of the river, in New Jersey, about thirty miles north of New York City. The view is to the north. (See page 5317)

Diomedes carrying the image, Ulysses tried to slay his companion and take the palladium. A glint of moonlight on his sword betrayed his purpose, and Diomedes compelled the disappointed Ulysses to march in front all the way back, hurried by slaps from the sword of his companion.

Different stories are told of the fate of the image. The Greeks are said to have obtained an imitation only, while the real statue was taken to Rome by Aeneas, where it was preserved in the temple of Vesta. Another legend placed the true image in the Parthenon at Athens. See ULYSSES; TROY; VESTA.

Modern Application. When one reads the phrase "the palladium of our liberty," the reference is to anything which affords effective protection, or which guarantees security Thus, trial by jury is considered a palladium of the civil rights of a people

PALLADIUM, a silver-white metal belonging to the same group of elements as platinum It was discovered in 1803 by William H. Wollaston, an English chemist, and was named for the asteroid Pallas, identified the preceding year. The element occurs chiefly in platinum ores, but is also found in combination with gold and silver. It can be drawn into a wire or hammered into sheets, being both ductile and malleable, melts at a temperature of about 2,815° F., and has a specific gravity of 11.8 Its symbol is *Pd.* Palladium bears a general resemblance to platinum, but is harder and lighter. Because of its capacity for absorbing hydrogen, it is used in chemical analysis, because of its hardness, lightness, and resistance to tarnish, it is employed in the construction of scientific instruments and for activation of reduction processes in chemical synthesis Palladium alloys are valued in making hairsprings for watches because their elasticity does not vary with the temperature. T.B.J

Related Subjects. The reader is referred in these volumes to the following articles

Chemistry (The Elements)	Malleability
Ductility	Platinum

PALLAS ATHENE, *ah the' ne,* a name given by the Greeks to the goddess whom the Romans called Minerva (which see).

PALM, *pahm.* What the seal is to the Eskimo of North America, the palm is to the native of tropical lands—the source of the prime necessities of life. Says Bayard, in *The Arab to the Palm*:

> Next to ye both I love the Tree
> Whose fluttering shadow wraps us three
> With love, and silence, and mystery!

The tree family of palms ranks second to the grass family in economic importance—for the latter includes our cereals, wheat, corn, rye, etc.—but the palms enjoy the distinction of being applied to a far greater variety of everyday human needs. The palmyra palm of India and Ceylon, for instance, is estimated to have 800 different uses. It can truly be said that "useful as well as ornamental" is a phrase to which the palm family has a stronger claim than any other group.

A Numerous and Ancient Family. Geologists have found palm fossils which prove that the family was once a great deal larger and more



Photo: O R O C

DATE PALMS

They lift their fronded heads aloft, with rich clusters of dates hanging from them.

cosmopolitan than it is to-day (see FOSSIL). In the infancy of the earth, palms grew luxuriantly as far north as Upper Canada and Greenland; now they are confined chiefly to tropical regions, although some varieties grow in more northern climates. Though it is on the decline, the family is still large, numbering about 1,100 different species. Palms are divided into two great classes: one is the *fan palm,* with leaves looking like huge palm-leaf fans split into slender strips often forty feet in length; the other, the *feather palm,* with leaves resembling uncurled ostrich plumes, sometimes



Photo U.S.D.A.

Of threads of palm was the carpet spun
Whereon he kneels when the day is done,
And the foreheads of Islam are bowed as one!

To him the palm is a gift divine,
Wherein all uses of man combine—
House and raiment and food and wine!

And, in the hour of his great release,
His need of the palm shall only cease
With the shroud wherein he lieth in peace

"Allah il Allah!" he sings his psalm,
On the Indian Sea, by the isles of balm,
"Thanks to Allah, who gives the palm!"
—WHITTIER: *The Palm-Tree*

as long as twenty feet. Among the fan palms, the most familiar are the *cabbage palmetto* of South Carolina, the *Washington palm* of the California deserts, and the *palmyra palm* of India and Ceylon. The *coconut palm* and *date palm* are the commonest types of the feathery-leaved class. The name of this tree family comes from the fact that the leaf of the fan palm looks like the outspread hand.

Habits of Growth. Most of the members of the family are towering giants, some of them reaching heights of eighty to 100 feet, with straight, branchless trunks surmounted by magnificent tufts, or rosettes, of waving leaves, and sheathed in shaggy masses, composed of the dead leaves of other years. The *doom palm*, cherished by the Arabs, is almost the only palm with a branched stem. There are *dwarf palms*, growing very low; palms that creep like vines; and still others, like the *rattans* (or ratans), that have stems hundreds of feet long and leaves with hooked ends, by means of which the plants climb from tree to tree.

The small greenish or yellowish blossoms that hang in great clusters on the palm tree are enclosed in sheaths which, in some species, literally explode into bloom. In many species the male and female—or staminate and pistillate—flowers grow on different trees, and natives, following the custom handed down from father to son, though without knowing the scientific reason, fertilize the blossoms of one tree by placing among them the blossoms of another (see CROSS-POLLINATION).

A Servant of Man. There is a poem of Whittier's called *The Palm-Tree* which tells some of the many hundreds of ways in which the palm makes itself useful to mankind. He describes a ship on the Indian Sea—a ship made of palm wood, with its sails and ropes woven from palm fiber, its master eating and drinking the products of the tree, his dress and turban fashioned from the fiber of its leaves, and the very prayer carpet on which he kneels spun from "threads of palm." A part of the poem is given under an illustration accompanying this article.

From the trunk of the date and palmyra palms, especially, comes timber for houses, furniture, fences, ships, spars, and wharves. The palmetto is particularly useful for wharf piles, since its corky wood is not easily rotted by water or destroyed by barnacles. The stems of the rattan furnish flexible material for wicker furniture and men's walking sticks.

From the pithy trunk of the *sago palm* and *cabbage palmetto* is secured the starchy meal called sago. The bud that grows at the top of the cabbage palmetto is sometimes cut out by natives, even though to do so means destroying the tree; boiled, this bud tastes much like cabbage. The sap of different species yields palm sugar, or *jaggery*, palm honey, palm wine, vinegar, or the spirit called *arrack*. The spines

which, in some branches of the family, grow from the leaf scars on the trunk, serve as needles for the women and as arrowheads and fishhooks for the men. In other species the scars exude a valuable resin or, as in the case of the *wax palm* of Peru, a vegetable wax, which is used in making candles.

The great leaves of the palmyra and most other palms are used for thatching native dwellings, and for walls, screens, and bedding. In South America a mother will put her baby to sleep in a cradle made from a gigantic palm



Photo: O R O C

A TRAVELER'S PALM

This Sumatra tree is so named because at the base of the stem it stores water which provides travelers with refreshing drink.

leaf, turning up its edges and hanging it among the branches, that baby may enjoy the lullabies of the wind and the birds. Matting, shields, hats, clothing, fans, baskets, and rope and twine are all made from the fibrous leafstalks. The fiber of the *piassaba palm* is found in many of the brooms and brushes in common use, from the finest to the coarsest.

Among the edible fruits, the date and the coconut are most widely used, the latter giving also its sweet milk, which in some places is prepared as a delicious wine. From the fruit or seed of the coconut, the *bacaba*, the *oil palm*, and scores of others is secured an oil that is put to many uses—as a butter, a lubricant, an illuminant, and a source of soap and candle grease. In Africa the seed of the date palm is roasted and used as coffee. The nut of the *ivory palm* yields a vegetable ivory which is employed as a substitute for elephant ivory. The seed of the *betel-nut palm*, mixed with lime, is spread on a leaf of the betel vine to make the narcotic that is so much chewed in India, destroying both teeth and initiative.

Familiar examples of the use of the palm as an ornament are the imposing avenues of tropical cities, lined with majestic *royal palms*, or with the *Mexican palmetto* that flourishes as far north as many Texas cities. The smaller palm of the conservatory, which is so popular for decorating spacious interiors, is cultivated for the market principally in the states of the South and the Middle West. The scientific name of the palm family is *Phoenicaceae*. G.M.S.

Related Subjects. The reader is referred in these volumes to the following articles

Betel	Ivory Palm
Cabbage Palm	Palmetto
Coconut	Rattan
Date	Sago

PALM BEACH, FLA. See FLORIDA (back of map).

PALMER, *pahm' ur,* ALICE FREEMAN (1855-1902), an American educator, college president, and the first dean of women in the University of Chicago. In 1920 her name was placed in the Hall of Fame (which see). She was born at Colesville, N. Y., was graduated in 1876 at the University of Michigan, and was a teacher before her appointment in 1879 to the chair of history at Wellesley College. Two years later, she was made acting president of the institution, and in 1882 was formally elected to the Wellesley presidency. In 1887 she was married to George Herbert Palmer, professor of philosophy at Harvard University, and resigned her position, though she did not give up her active interest in educational work. When the University of Chicago was organized, in 1892, Mrs. Palmer was made non-resident dean of women. The chimes in Mandel Tower at that institution were installed in her honor by her husband. Wellesley campus contains a memorial to her by Daniel Chester French, a fine example of relief sculpture.



Photo· Brown Bros

ALICE FREEMAN PALMER

PALMERSTON, *pahm' ur stun,* HENRY JOHN TEMPLE, third Viscount (1784-1865), an English statesman, prominent in the foreign affairs of his country in the nineteenth

century. He was born in Hampshire, educated at the University of Edinburgh, and entered Parliament in 1807. Two years later he became Secretary of War, holding this office until 1828, through six administrations. In 1830 he accepted the post of Secretary of State for Foreign Affairs in Earl Grey's Cabinet, and filled the office, except for a brief interval, for eleven years.

From 1841 to 1846, Palmerston was out of office, but with the return of the Whigs to power, he again became Foreign Secretary. His openly expressed approval of Louis Napoleon's act in declaring himself emperor of France (as Napoleon III) led to his dismissal from the Cabinet in 1851, but in the new Ministry formed the next year, he became Home Secretary. Three years later, when the Earl of Aberdeen's administration proved unable to cope with the Crimean War, Palmerston was made Premier and brought the war to a successful conclusion. A vote of censure for his action in regard to the difficulties in China led to his resignation in 1857, and although an appeal to the people returned him to power, he was again defeated in 1858, on a vote disapproving his relations with Napoleon III. In the next year, he again became Prime Minister, and continued in the office until his death.



Photo Brown Bros

LORD PALMERSTON

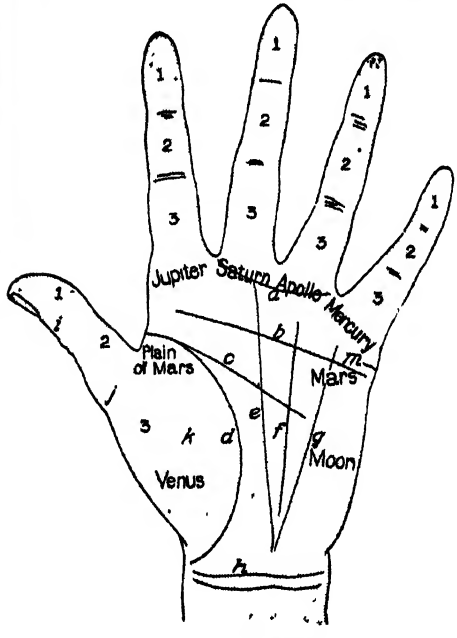
Intensely interested in making England respected abroad, Palmerston won the admiration of continental statesmen, but he lacked the insight that was necessary to bring about much-needed reforms in England's domestic affairs.

PALMETTO, *pal met' o,* the name applied to several kinds of fan-leaved palm trees, the best known being the *cabbage palm.* South Carolina has a picture of this tree on its coat of arms, and is sometimes called the *Palmetto State* (see SOUTH CAROLINA). Among other species are the *dwarf, blue,* and *saw* palmettos, which are found in low regions along the United States coast, particularly in the southeastern part of the country, and in the West Indies Some of these trees grow to a height of fifty feet, but the *dwarf,* as its name suggests, is low and stemless.

In countries where it grows, piers and wharves are made from the durable wood of the cabbage palm, and its fibrous leaves are made into hats, baskets, and fans. See PALM, CABBAGE PALM. G M S.

PALMETTO STATE, a popular name applied to South Carolina (which see).

PALMISTRY, *pahm' is trie.* Near the close of the eighteenth century, a palmist foretold the downfall of Napoleon. Because of the greatness of the conqueror, the havoc wrought by his wars, and the ultimate fulfillment of the prophecy, new interest was stimulated in the ancient practice of reading character and personal fortune from lines and creases in the palm. Along with other pseudo-sciences, palmistry has fallen into disfavor with scientific-minded people of to-day, but palm-readers flourish in Oriental countries, and there are many in Western lands who profess to believe



THE HAND IN PALMISTRY

(*a*) Ring of Venus
(*b*) Line of heart
(*c*) Line of head
(*d*) Line of life
(*e*) Line of fate
(*f*) Line of fortune
(*g*) Line of health
(*h*) Bracelets
(*i*) Will
(*j*) Reason
(*k*) Love
(*m*) Line of marriage

The numbers 1, 2, 3 refer to the mounts of the joints in fingers and thumbs.

in it The principles on which it is based may be briefly stated as follows:

In palmistry the *mounts* of the hand and the *lines* in the palm are made to tell the story of individual destiny. The mounts are the elevations at the base of the fingers and thumb and in the palm from the little finger to the wrist. They are named for the planets, and are seven in number (see diagram). When well developed, the mounts indicate the possession of the quality associated with the respective planets. For example, a strong mount of Jupiter denotes

pride and ambition; Apollo, art, riches; Saturn, fatality, Mercury, science, wit; Venus, love, music, Mars, cruelty, courage.

The principal lines are shown in the illustration. The line of life surrounds the thumb; if long, it indicates long life, but if not continuous, that is, if broken, from whatever cause, the possessor will not live to old age. The line of heart, if long, distinct, and well colored, indicates an affectionate disposition; the nearer the line stretches toward Jupiter, the more favorable the opinion as to devotion of character and warmth of affection A strongly marked line of head is alleged to indicate superior intellectual qualities, in addition to imagination, provided the line stretches to the mount of the moon. If the line of head is winding, it is supposed to show indecision of character and a tendency to frivolity.

Enough has been outlined above to make clear the general basis on which palmistry builds its supposed science. Its arguments are ingeniously framed, but there is offered no satisfying theory as to the correctness of its assumptions

Relating to Various Beliefs. The articles on the following topics, while not bearing on palmistry, are of interest in this connection

Alchemy	Necromancy
Astrology	Occult
Clairvoyance	Phrenology
Conjuring	Physiognomy
Demonology	Psychical Research
Divination	Psychoanalysis
Faith Cure	Spiritualism
Hypnotism	Subconscious
Magic	Suggestion
Medium	Superstition
Mesmerism	Telepathy
Mind Reading	Witchcraft

PALM OIL, a thick, yellowish oil obtained from the fruit pulp of the oil palm (*Elaeis guineensis*) of West Africa. It is of a butter-like consistency when cool, is dark orange in color, and has so pleasant an odor that the natives of the Gold Coast use it for butter, although it is liquid in that climate. It is largely imported for the manufacture of soap and candles and for lubricating purposes, and is also very widely used to flavor toilet preparations

The fruit of the oil palm is approximately the size of a date, and consists of a deep-red fleshy portion, which encloses a stony kernel. A mature tree bears about ten clusters of some 200 nuts When the fleshy portion is boiled, it yields the palm oil described above, which is widely used in soap-making. The kernels are generally shipped to Europe or America, and there crushed in hydraulic presses. The white fat extracted from the kernels is extensively employed in the manufacture of margarine (oleomargarine). After the oil has been extracted, the crushed kernels are used as a cattle feed. See PALM; OLEOMARGARINE. G.M.S.

PALM SUNDAY, the last Sunday of Lent, the Sunday preceding Easter, and the first day of Holy Week. It was first celebrated in the fourth century, by the Christian Church in Jerusalem, in commemoration of the triumphal entry of Jesus, when He rode into the city seated on an ass, and the multitude strewed branches in His way (*John* XII, 12-15). It was a festival of joy, a procession starting at the Mount of Olives and passing from one to another of the churches, the bishop taking the part of Jesus and riding on an ass, and the children singing and waving palms. The later observance of Palm Sunday in the Roman Catholic Church took the form of a solemn processional and a mass of mourning In the Middle Ages, the Church added the ceremony of the consecration of the palms by the priests. These palms were taken home by the people as tokens of good This custom is followed in Roman Catholic churches to-day.

PALMYRA. See SYRIA (The Cities).

PALMYRA PALM, a species of palm occurring throughout India and near-by islands and in other tropical regions. It is one of the most useful plants known. The wood is employed for building houses in the countries where it grows, the leaves are utilized for thatch, baskets, mats, hats, fans, and umbrellas, the fiber for twine and rope, and the fruit, seeds, and stalks (of the young plant) are eaten. In the northern part of Ceylon, the palmyra palm is almost the sole source of livelihood for thousands of the natives. The plant grows from twenty to seventy feet in height, bearing fan-shaped leaves four feet long, and a large, triangular-shaped fruit. See PALM. G.M.S.

Scientific Name. The palmyra palm belongs to the family *Phoenicaceae* Its botanical name is *Borassus flabelliformis*

PALO ALTO, *pah' lo ahl' toh,* BATTLE OF. See MEXICAN WAR.

PALO ALTO, *pa' lo al' toh,* CALIF. See CALIFORNIA (back of map).

PALPITATION OF THE HEART, a very rapid beating of the heart, producing, in varying degrees, the sensations of heart-beating, suffocation, shortness of breath, or other distressing feelings. It may be a symptom of organic heart disease, or of goiter, and is often brought on by anaemia (which see). A very common cause is flatulence, that is, gas in the stomach, as a result of indigestion. In this case, the upward pressure of the gas bag on the diaphragm causes the irregularity of the heart's action. Shock, excitement, and excessive use of stimulants may bring on attacks. Persons who suffer from palpitation, through wrong habits of eating and indulgence in stimulants, should correct their habits. Frequent and persistent attacks, indicating the presence of a more serious condition, call for

treatment by a reliable physician. For other suggestions, see HEART (Care of the Heart; Diseases of the Heart). W.A.E.

PAMELA, *pam' e lah.* See NOVEL (The Novel in England).



LOCATION OF PAMLICO SOUND
The low, swampy section of North Carolina The land between the sound and the ocean is a narrow ribbon of sand

PAMIR, *pah meer'*, one of the highest plateaus in the world, situated in Central Asia, in the southeast corner of Turkestan, in the region where the Himalaya, Hindu Kush, Kuen-lun, and Tian-shan mountain systems converge. The greater part of the plateau is barren and mountainous, but in the valleys along the few lakes and the River Oxus, which has its source here, the native Kirghiz find pasture for their cattle during the summer. Snow covers the land and blocks the passes for more than half the year, and high winds prevail most of the summer, though that season is rather pleasant on the whole. Two important trade routes across Pamir have been used for ages, and, according to tradition, it is the original home of the Aryan, or white, race. The area is 36,000 square miles; the mean elevation, from 13,000 to 15,000 feet above sea level.

Pamir is on the frontier of the Russian and British possessions in Asia, and for this reason, and in the name of science, it is probably the most explored region in Central Asia. Pamirsky Post, on the Murghat River, has been established by Russia as a fortified military base. See ASIA (How the Continent Is Divided).

PAMLICO, *pam' lih ko*, **SOUND**, the largest sea lagoon on the Atlantic coast of the United States, an indentation of North Carolina. At its northeastern extremity, it is connected with Albemarle Sound by a small outlet, Croatan Sound, and at the southwestern end it has communication with the ocean by Core Sound. These outlets are about sixty miles apart. The greatest width of Pamlico Sound is about twenty-four miles. A long, narrow beach, cut by three navigable inlets, separates the sound from the Atlantic on the east. On this beach is Cape Hatteras, the farthest point extending into the ocean. The Neuse and the Pamlico rivers flow into the sound through estuaries. It has valuable oyster beds.

PAMPAS, a Spanish word meaning *plains*, is used to designate several great plains of South America, but is most commonly applied to the immense grass-covered plain in the central part of Argentina, between the Rio Salado on the north and the Rio Negro on the south, which merges into the steppes of Patagonia. During the wet season, a luxuriant growth of vegetation provides pasturage for cattle and sheep, but an increasing proportion of the region is being devoted to agriculture. It is one of the most fertile plains in the world. See STEPPES; ARGENTINA. R H.W.

PAN, a Greek god. According to classical mythology, he was a woodland deity, the god



Photo Visual Education Service

"YOUNG PAN"

[Sculpture by Janet Scudder, American.]

of hunters, fishermen, and shepherds. He was the son of Hermes, and at his birth was so frightful-looking that his nurse fled in terror. This ability to inspire unreasoning fear continued to be one of his chief attributes, and the word *panic* is derived from his name. Hermes, however, was not disturbed by his appearance, but took him to Olympus, where he became a favorite of the gods.

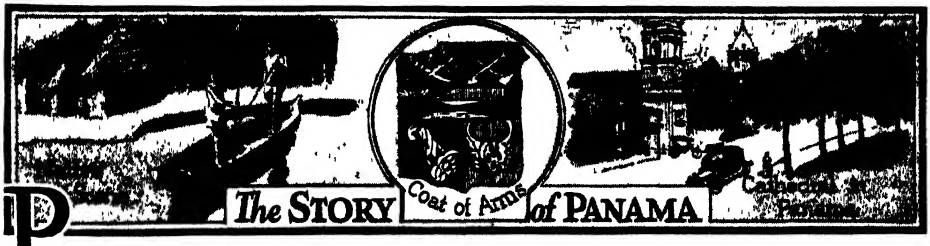
Pan is usually represented as half animal and half man, with goat's feet, curly hair, horns, and a beard. His name originally meant

pasturer, but later it came to mean the universal god (Pan, *all*). A temple dedicated to all the gods was a *pantheon*.

The worship of Pan was at first restricted to his own country, Arcadia, but later it spread to Athens and other centers. The large number of statues and bas-reliefs which have been discovered among the ruins of ancient cities are evidence of his wide popularity. He was usually represented as attended by fauns and satyrs.

Related Subjects. The reader is referred in these volumes to the following articles

Fauns Olympus Pantheon Satyr

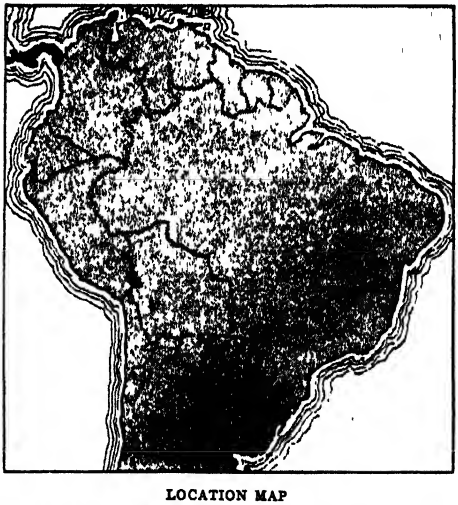


PANAMA, *pan ah mah'*, the youngest republic on the western continents, occupying practically all of the narrow Isthmus of Panama, which joins the two Americas. This small country, owing to its location, has played an interesting part in the world's history for many centuries Its northern, or Caribbean, coast was sighted and explored by Columbus in 1502, on his fourth and last voyage to the New World; and eleven years later, from one of its mountains, Balboa first viewed the Pacific Ocean. At the time of the conquest and exploitation of Peru, the Spaniards found the isthmus a convenient pathway for the conveyance of their treasures of silver and gold, and Panama, on the southern coast, and Portobello, on the northern, developed into noteworthy towns a hundred years before the Pilgrim Fathers landed on Plymouth Rock. The wealth of Peru was first shipped to Panama, then carried overland to Portobello, and from there transported to Spain across the Atlantic. The construction of a canal across the isthmus, a familiar matter of recent history, was considered by the Spaniards hundreds of years ago, and the story of the various attempts to build such a waterway, culminating in the successful effort on the part of the United States, is an interesting narrative.

Size and Location. The country of Panama is long and narrow, and runs approximately east and west. The northern coast is washed by the Caribbean Sea, an arm of the Atlantic, and the southern by the Pacific Ocean. On the east lies the republic of Colombia, and on the west the Central American state of Costa Rica. According to official figures, Panama covers an area of 32,388 square miles, a little less than that of Maine. The extreme length is about 480 miles, and the breadth varies from thirty-one miles to 118 miles. The coast line on the Caribbean Sea is 478 miles; that on the Pacific, 767 miles. The latter is deeply indented by the Gulf of Panama.

Canal Zone. On each side of the Panama Canal there is a strip of land five miles wide. This section, called the Canal Zone, was granted the United States for "use, occupation, and control." For detailed information, see PANAMA CANAL.

The People. The inhabitants of the republic, without counting the people in the Canal Zone, numbered 446,700 in 1920. The population is made up of whites, who are mostly of



LOCATION MAP

Since the political separation of Panama from Colombia, there has been considerable discussion of the question of Panama's geographical status. As a part of Colombia it was also a part of the South American continent. As an independent country, whose interests are largely with the United States, geographers now consider it to be a North American division

Spanish descent; of Indians, who are natives of this region; of blacks, descendants of the slaves brought from Africa; and of mestizos, a dark-skinned people of mixed Spanish, Indian, and negro descent. Mestizos form more than half of the population. There are, besides, hundreds

of Europeans and people from the United States; the latter are increasing in number.

Primary education is compulsory from the ages seven to fifteen years. In addition to over 600 public schools which the government maintains, there are over twenty private educational institutions. Professional instruction is given at the Instituto Nacional, established in 1911. A university (Universidad Bolivariana) was founded in 1926. Spanish is the official and popular language of Panama, and the religion of the country is Catholic, except in the Canal Zone, where Protestantism prevails.

Cities. The two principal cities and seaports, and the terminals of the canal, are Panama, the capital, and Colon. Neither of these cities is included in the government of the Canal Zone.

Panama, the first city founded by Europeans on the American continent, is now the capital and largest city of the republic of Panama It is at the Pacific end of the Panama Canal, and is the chief port of the country. Strange as it seems, Panama, on the Pacific Ocean, is twenty-two miles east of Colon, at the Atlantic end of the Panama Canal. This is due to the form of the isthmus at the point where the canal joins the seas.

The city was founded in 1519 by a Spaniard, Pedro Arias de Avila It has experienced many changes of fortune, and has been in turn rich, powerful, poor, and insignificant. During the sixteenth century, the city, with a single exception, was the strongest Spanish fortress in America In 1671 it was burned, and its treasures were carried away by the buccaneer, Henry Morgan (which see) Two years after this disaster, the city was rebuilt on its present site, which is five miles west of the original location, and it soon flourished again Until the end of the eighteenth century, it remained the chief Pacific port for all Spanish trade. In 1855 a railroad, built and operated by New York capitalists, was opened from Panama to the island of Manzanillo A new town was founded on this terminal with the name of Colon, which for some time was also called Aspinwall Since that time, Panama has been an important center for reshipping cargoes of all kinds.

Panama of the twentieth century owes its importance not to a railroad, but to the great Panama Canal. Until the building of that waterway, the city was not a healthful place in which to live. When the United States took over the construction of the canal, the first thing to be done was to make the city a safe and sanitary place in which white men could live and work Under the treaty of 1903, and at the expense of the republic of Panama, streets were drained and paved, a sewerage system was constructed, and most important of all, yellow fever and malaria were practically exterminated

The importance of Panama is due to the trade which passes through it The harbor is shallow, but the American-built docks at Balboa, three miles away, furnish excellent facilities for shipping. All of the important buildings, except the cathedral and the President's Palace, are modern, and the national theater and the municipal building have been completed since 1903, when Panama declared its independence. The streets, compared to American streets, are narrow, but are clean and well paved All sanitary arrangements are under the control of the United States, but, with this exception, it is governed as part of the republic of Panama. Population, 1920, 59,458.

Colon, a seaport and northern terminus of the Panama Canal, founded in 1850 by New York promoters of the Panama Railroad For a number of years Colon was called Aspinwall, in honor of William H. Aspinwall, one of the promoters; the name was later changed by statute to Colon, in memory of Christopher Columbus In matters of sanitation and quarantine, Colon is under the jurisdiction of the United States, but for all other governmental purposes, it is a part of the republic According to its original franchise from the United States of Colombia, the Panama Railroad owns most of the land in the city When the United States acquired the railroad, it thereby became owner of the land, but does not have the right to sell it Adjacent to Colon, however, and practically a part of that city, is Cristobal, an American town, the eastern terminal headquarters for the great canal enterprise of the United States There are located the shops of the Panama Railroad and a great cold-storage plant of the Isthmian Canal Commission

Colon has an extensive harbor accommodation, and although it had an important transit trade before the Panama Canal was begun, the place has since been transformed A long breakwater was erected, and the city is now a port of call for over a dozen lines of steamers From a population of about 3,000 negroes and Spanish-speaking natives of mixed blood, Colon had grown to a population in 1920 of 31,203, through the work of the Panama Commission From a place of filth and disease it has developed into a city of wide, regular streets, better homes, and good sanitation.

Physical Features. The greater part of the country is occupied by forest-covered hills and low mountains, separated by deeply cut drainage valleys. In the western section, near the Costa Rica boundary, several lofty extinct volcanoes, some over 11,000 feet in altitude, give the scenery an element of grandeur. There are three passes through the highlands, affording communication between the two seacoasts -- San Blas, Caledonia, and Culebra Through Culebra, which is the lowest, the Panama Canal was cut.

Over 300 of the streams of the isthmus flow into the Pacific, and about 150 into the Atlantic. The country between the Colombia boundary and the Gulf of Panama is drained chiefly by the Tuira, which flows into the Pacific; west of this section is a region drained by the Bayano, or Chepo, and its tributaries; still farther west is the drainage basin of the Chagres, the waters of which are utilized to supply the locks of the canal. The country westward to the Costa Rican boundary is watered by several minor river systems. There are no natural lakes.

Climate. Panama has a tropical climate, for the Canal Zone is only nine degrees north of the equator. The mean annual temperature is not over 80° F., which is about twenty-five de-



Photo Keystone

A Pleasing Tropical View. Looking down from Ancon Hill upon the city and bay of Panama, at the Pacific Ocean terminus of the canal.

grees higher than the mean annual temperature of the chief cities in the Southern United States; there is practically no variation in temperature in the Canal Zone for the entire year. The year has only two seasons, a rainy season and a dry season. The former lasts eight months, from April to December, but even during the dry season showers are frequent; in fact, Panama is one of the wettest regions in the New World. In addition to a tropical climate, there are several jungle swamps which are breeding places of mosquitoes, the carriers of malaria and yellow fever. Only those sections which have used modern sanitation to fight unhealthful conditions are free from tropical diseases. The entire Canal Zone is free from these dangers.

Natural Resources. Though the soil is rich and the rainfall is abundant, only a small portion of the isthmus is under cultivation. Nearly half of the country is not even inhabited. Bananas are grown in large quantities, and their harvesting and shipment form the principal industry, which is practically controlled by an American corporation, the United Fruit Company. Coconuts, coffee, tobacco, ivory, nuts, sweet potatoes, cacao, cereals, and sugar cane are other cultivated products; however, the domestic vegetable supply is inadequate, and quantities must be imported. In the forests are found palms and rubber trees; hardwoods such as the mahogany, cedar, and rosewood; sarsaparilla, copaiba, and other medicinal plants, and various dyewoods. There are valuable pearl fisheries along the coasts of the Pearl Islands, in the Gulf of Panama. The isthmus contains deposits of gold, copper, iron, and salt, but the mines are just beginning to be developed. Manufactures are insignificant; imports overbalance exports three to one.

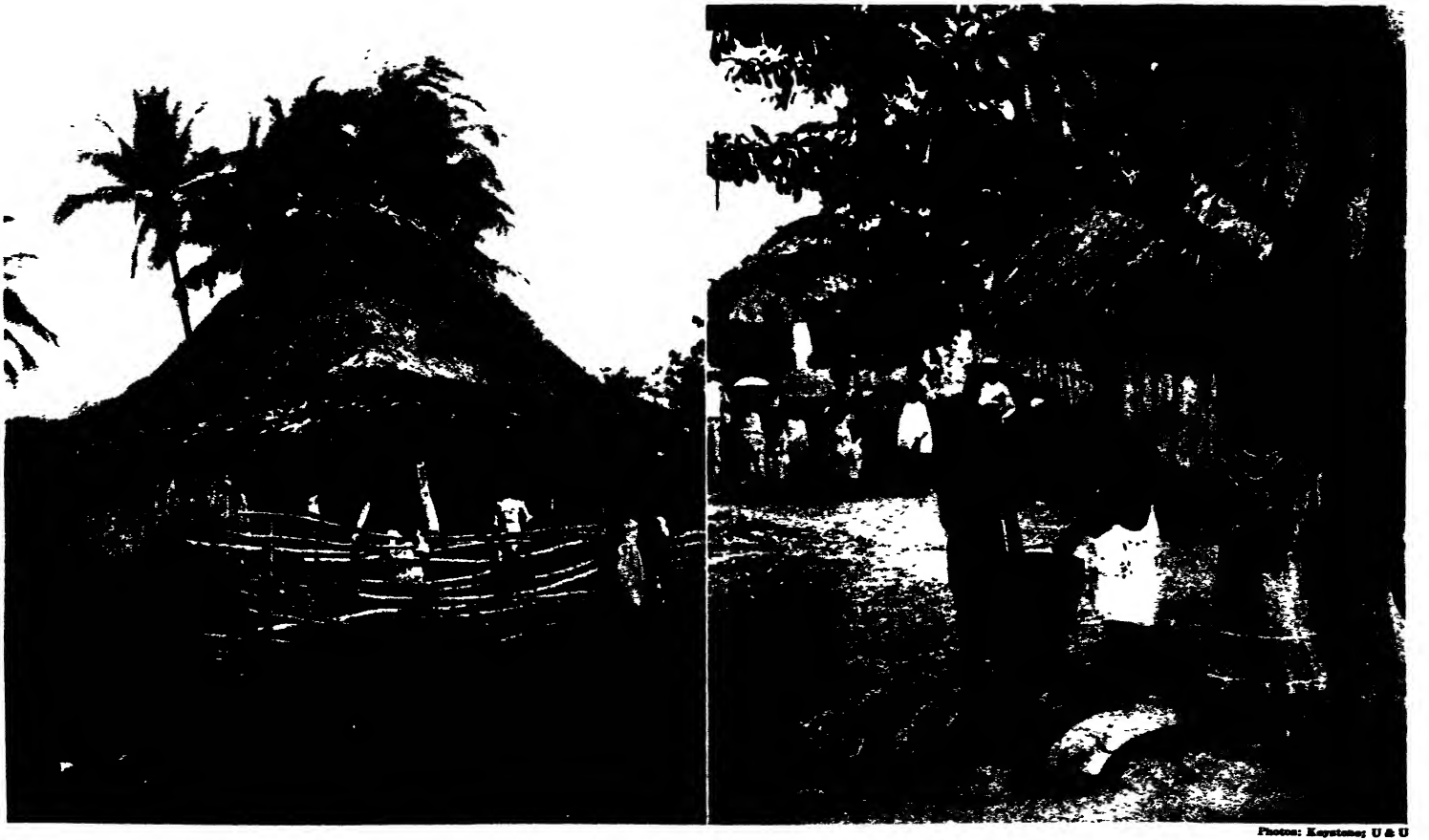


Photo: Keystone

CATHEDRAL AT PANAMA CITY
One of the most imposing buildings in the republic, built in Spanish style.

Government. Panama is governed under a Constitution adopted on February 13, 1904, and modeled after that of the United States. The President is chosen by popular vote for four years, and is not eligible for reëlection in two consecutive terms. He must be over thirty-five years of age. The legislative power is vested in the National Assembly, a single chamber of forty-six members called Deputies, who are chosen by the people for four years. A Cabinet of five members assists the President, and there are three Vice-Presidents. Panama is divided into nine provinces, the governors of which are appointed by the President. At the head of the judicial system is a Supreme Court, with five justices appointed by the President.

History. Spanish rule over the isthmus ended in 1821, when Panama achieved independence and voluntarily incorporated itself in the old Republic of Colombia, formed by Venezuela, New Granada, and Ecuador. After the dissolution of Greater Colombia, Panama remained a part of New Granada. In 1830 and 1831, two secessionist movements took place. In 1840 another movement resulted in complete separation and the constitution of the Free State of the isthmus for more than a year. In 1846 a treaty was concluded between New Granada and the United States, by which the latter obtained the right to guard the trade route and preserve the neutrality of the isthmus. In 1855 Panama, though federated with New Granada, was organized as an autonomous state, and enjoyed a considerable degree of local self-government until 1886, when it was incorporated as a province of Colombia and subjected to a strongly centralized system of government. This change was not satisfactory to the inhabitants, and the misrule of Colombia provoked



Photos: Keystone; U & U

Natives at Home. At the left is a type of the homes of the humble citizens of Panama, near Empire, in the Canal Zone. At the right the children are seen pounding rice. The location is a village of not more than twenty huts, quite a distance from the nearest large town. The population of such a community is of mixed blood—partly Spanish, partly Indian, with an occasional African strain.

not less than fifty-three revolutions in a period of fifty-two years, between 1850 and 1902.

In 1903 the United States attempted to make a treaty with Colombia whereby the former should have the privilege of the construction of the Panama Canal. In August of that year, the Senate of Colombia rejected the treaty. The representatives from Panama withdrew, refusing to maintain any longer political relations with the government of Colombia, for they felt that the future interests of Panama were imperiled. In November, 1903, after a bloodless revolution, Panama declared itself an independent republic. The United States immediately recognized the new government and concluded with it a treaty setting aside for American uses the Canal Zone (see PANAMA CANAL).



Photo Visual Education Service

CORNER OF A TYPICAL MODERN SCHOOL BUILDING
In the city of David (15,000 population), near the western boundary of the republic

The boundaries between Panama and Costa Rica were established in 1900 by an arbitral decision of President Loubet of France, but Costa Rica was dissatisfied with it, and in 1905 Costa Rica made overtures for a boundary treaty which, however, it failed to ratify. In 1910 Chief Justice White of the United States Supreme Court was selected as arbitrator to establish the boundary by way of interpretation of the Loubet Award, but this decision, rendered in 1914, treated the Loubet line as null and void and traced an entirely different boundary, for which reason Panama protested the Award as being an excess of jurisdiction.

In 1921 Costa Rica invaded part of the disputed territory, and during the hostilities which ensued, the Costa Rican forces were defeated and made prisoners by the Panamanos in three encounters. Intervention of the United States put an end to hostilities, and forced the Panamanos to abandon the invaded territory, but they still refuse to recognize the White Award as valid.

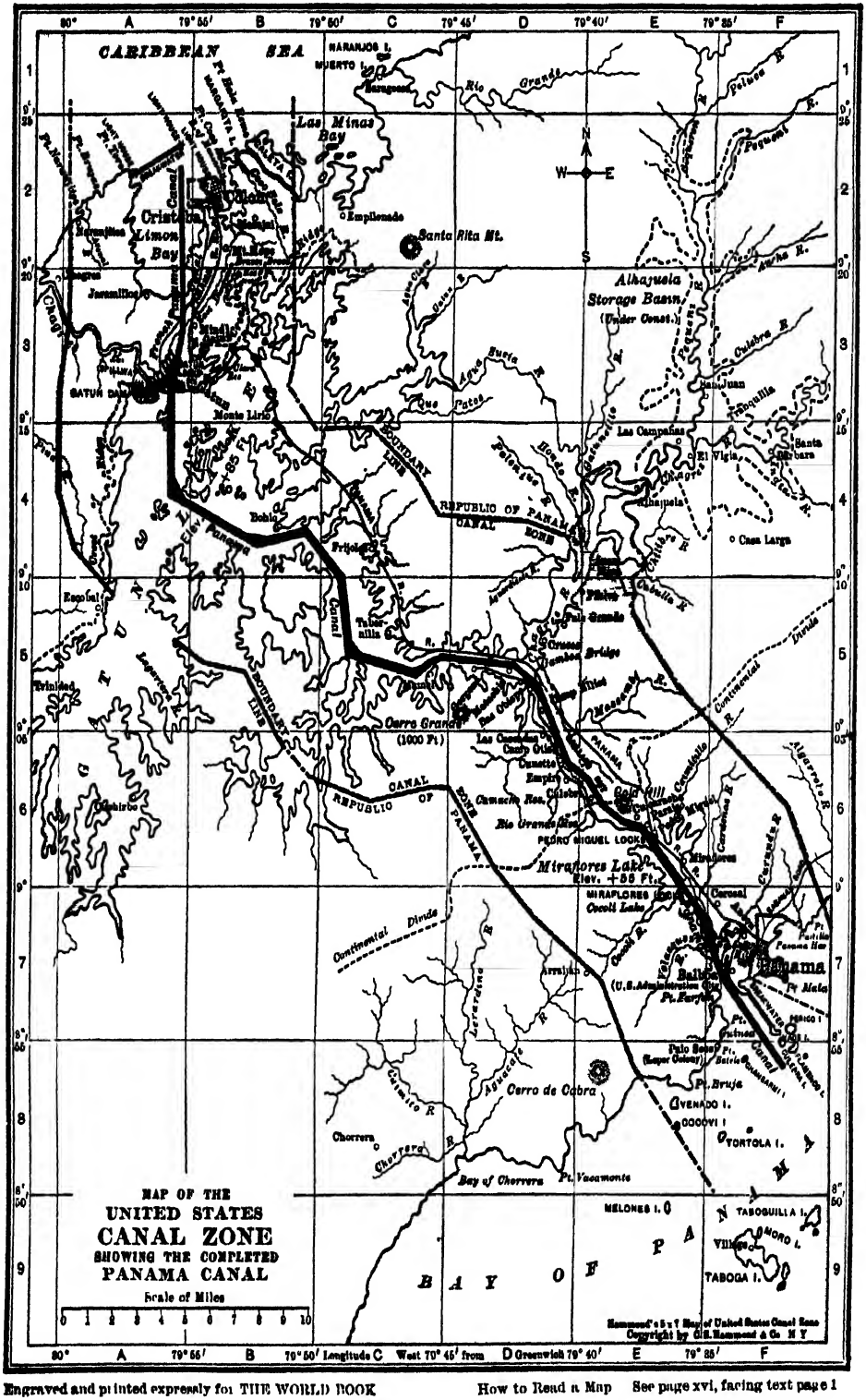
Panama declared war on Germany April 7, 1917, the day following the United States declaration, and in 1920 it became a member of the League of Nations. A series of difficulties, arising out of the relations created by the treaty of 1903 and the construction of the Panama Canal, were the subject of diplomatic discussions which began in 1922 and ended with an extensive treaty signed in 1926, which purports to regulate the intercourse between the territory of the Republic of Panama and the Canal Zone. One cause of anti-American feeling was the presence of stores and warehouses operated by the United States in the Canal Zone; the people of Panama considered that they interfered with the trade in the neighboring country. Boycotts were even threatened against American goods. An important article of the 1926 treaty refers to the protection and defense of the Panama Canal. Its substance is as follows:

> The republic of Panama agrees to cooperate in all possible ways with the United States in the protection and defense of the Panama Canal. Consequently, the republic of Panama will consider herself in a state of war in case of any war in which the United States should be a belligerent, and in order to render more effective the defense of the canal, will, if necessary in the opinion of the United States government, turn over to the United States in all the territory of the republic of Panama, during the period of actual or threatened hostilities, the control and operation of wireless and radio communication, aircraft, aviation centers, and aerial navigation . and the United States shall have the direction of the republic of Panama.

In September, 1927, in the assembly of the League of Nations, the Panama representative declared that, despite the rights of the United States in the Canal Zone, his country still had sovereignty over that territory, and that it was the duty of the League of Nations, through the Permanent Court of International Justice, to intervene if the United States failed to recognize this sovereignty. Secretary Kellogg denied that the League of Nations would have jurisdiction in the matter, and pointed out that the sovereignty of the Canal

CANAL ZONE

Agua Clara Reservoir....B 3
Aguardiente River . . ..D 5
Ancon, 1,674..... ... F 7
Ancon Hill.. ....F 7
Arenal River. . . . . ..A 2
Balboa (U. S Administration City), 1,146....F 7
Bas Obispo, 472... . D 5
Batele, Point ... .F 8
Bohio, 279.. .B 4
Brazos Brook Reservoir B 2
Breakwater . . A 2
Breakwater. . F 7
Bruja, Point . F 8
Brujas, Point . .A 2
Caimitillo River .. . E 6
Caleta Island .. .B 2
Camacho Reservoir ... D 6
Camp Elliot, 455 . D 5
Camp Otis, 880.. D 6
Cardenas River .. F 6
Caribbean Sea . . A 1
Cerro Grande . . C 5
Chagres River . . D 5
Changarmi Island . F 8
Cocoli Lake E 7
Cocoli River.... . . . E 7
Coco Solo, Point.....B 2
Coco Solo River . . B 2
Cocovi Island.. . ...E 8
Colon, 31,203 ...B 2
Continental Divide . C 7
Coronal, 1,035 . F 7
Crest of Ridge B 3
Crest of Ridge A 4
Cristobal, 3,584 A 2
Cruces D 5
Cucaracha, 358 E 6
Culebra, 2,032 E 6
Culebra Island F 8
Cunette . D 6
Curundu River F 6
East Diversion . B 3
Empire, 7,152 D 6
Farfan, Point E 7
Flamenco Island F 8
French Canal A 3
Frijoles, 96 C 4
Gaillard Cut . . E 6
Gamboa Bridge .D 5
Gatun, 8,887 .B 3
Gatun Dam .A 3
Gatun Lake. . . .A 5
Gatun Locks ....B 3
Gold Hill. .. ..E 6
Gorgona, 3,444 .. ....D 5
Guinea, Point. ... F 7
Hala Remo, Point . ..B 2
Jaramillos . . ..A 3
Juan Mina ..E 4
Las Cascadas, 1,190 D 6
Limon Bay . .A 2
Lion Hill B 4
Mala, Point F 7
Mamei C 5
Manzanillo, Bay of B 2
Marajal B 2
Margarita Island B 2
Massambi River E 5
Matachin, 796 D 5
Mindi B 3
Miraflores, 1,230 E 6
Miraflores Lake E 6
Miraflores Locks E 7
Monte Lirio, 390 B 3
Moro Island F 9
Mount Hope, 1,134 B 2
Naos Island F 7
Naranjitos A 2
Naranjitos, Point . A 2
North Gatun .. B 3
Paitilla, Point ... F 7
Palo Grande .... . D 5
Palo Seco (Leper Colony), 2,239 . E 8
Panama, 59,458 .. F 7
Panama, Bay of .. D 9
Panama Canal . . B 4
Panama Harbor . F 7
Paraiso, 2,339 E 6
Pedro Miguel, 2,278 E 6
Pedro Miguel Locks . E 6
Perico Island . F 7
Pihiva . E 5
Rio Grande Reservoir . D 6
Sabanas Road F 7
Spillway A 3
Tabernilla, 50 . C 5
Taboga Island F 9
Taboguilla Island F 9
Toro, Point A 2
Tortola Island F 8
Velazquez River E 7
Venado Island E 8
Village..... . . F 9


CARIBBEAN SEA
Las Minas Bay
Limon Bay
Cristobal
Colon
Empilonado
Santa Rita Mt.
Albayuela Storage Basin (Under Const.)
Gatun Dam
Gatun Lake
Monte Lirio
Bohio
Frijoles
Gamboa
Culebra
Las Campanas
El Vigia
Santa Barbara
Casa Larga
Paraiso
Pedro Miguel
Miraflores Lake
Elev. +55 Ft.
Miraflores Locks
Balboa
Panama
Cerro Grande (1000 Ft.)
Cerro de Cabra
Chorrera
Bay of Chorrera
Pt. Vacamonte
Pt. Bruja
Venado I.
Tortola I.
Melones I.
Taboguilla I.
Taboga I.
Toro I.
Naos I.
Perico I.
Flamenco I.
Culebra Cut
Continental Divide
Republic of Panama
Canal Zone
Boundary Line
Panama Canal
Rio Grande
Rio Chagres
Rio Trinidad
Rio Gatun
Rio Obispo
Rio Pequeni
Rio Agua Sucia
Rio Que Pates
Rio Caimito
Rio Arenoso
Rio Mamoni
Rio Cirri Grande
Rio Cirri Viejo
Rio Pedro Miguel
Rio Grande
Rio Cocoli
Rio Curundu
Rio Cardenas
Rio Algarrobo
Rio Chilibre
Rio Chilibrillo
Rio Mindi
Rio Mandinga
Rio Piedras
Rio Lagarto
Rio Arenoso
Rio Boqueron
Rio Arenoso
Rio Aguacate
Rio Caimito
Rio Chorrera
Rio Lagartera
Rio Agua Clara
Rio Agua Sucia
Rio Que Pates
Rio Pequeni
Rio Pequeni
Rio Chagres
Rio Trinidad
Rio Obispo
Rio Gatun
Rio Grande
Rio Grande
Rio Chagres
Rio Trinidad
Rio Obispo
Rio Gatun

Zone had never been discussed with the Panama government. Although the President of Panama objected to this stand, nothing further was done. In January, 1928, Colonel Charles A. Lindbergh visited Panama on his good will and hunting trip in the Panama Highlands. R.J.A. AND J.F.M'K.

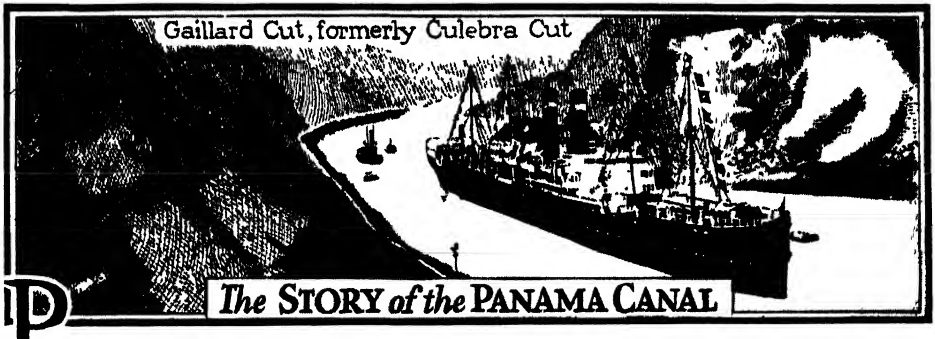
Related Subjects. The following articles in these volumes may be consulted in connection with this topic

Balboa, Vasco Nuñez de	League of Nations
Central America	Lindbergh, Charles A
Colombia	Panama Canal

PANAMA (city), the capital of the republic of Panama See PANAMA (Cities).

PANAMA, ISTHMUS OF, the strip of land that connects North and South America. In a more limited sense, the term has been applied to the narrow section between the cities of Colon and Panama, through which the Panama Canal was dug; a similar section farther east has been called the Isthmus of Darien. The general tendency at the present time, however, is to consider the entire neck of land practically coextensive with the republic of Panama as the Isthmus of Panama. R.H.W.

Related Subjects. For size and topographical features, see PANAMA The story of the excavation of the canal which gave the isthmus its commercial importance is related under PANAMA CANAL



The STORY of the PANAMA CANAL

PANAMA CANAL. Ever since the day that marked the triumph of the adventuring Spaniard, Balboa,

> . . when with eagle eyes
> He stared at the Pacific—and all his men
> Look'd at each other with a wild surmise—
> Silent, upon a peak in Darien,

men have dreamed of a great waterway across the narrow band between the two Americas Four hundred years later, the visions of the early dreamers materialized. There is a canal, and one far greater than entered into the thoughts of most of those who first advocated such a watercourse. The ships that pass through it carry cargoes richer than the gold-laden caravels for which King Ferdinand or King Philip would have liked to build it, and its existence has already produced advantages more far-reaching than any estimates of early days.

How the Canal Was Built. The question of a waterway between the two oceans was of interest to the United States even before the "forty-niners," the early gold-seekers, made their way to California, but not until 1902 was the Panama route favored. The treaty of 1846 with New Granada (now Colombia), the Clayton-Bulwer Treaty of 1850 with Great Britain, and the Nicaragua treaty of 1867 guaranteed the neutrality of a canal, but referred equally to all possible routes. In 1855 New York capitalists built the Panama Railroad, from Colon (then called Aspinwall) to Panama, and in 1881 a French company, headed by De Lesseps, the successful builder of the Suez Canal, commenced to dig the passageway. This company continued until dissolved by bankruptcy eight years later, when a second company was organized In all, the French company excavated nearly a third as much earth as the Americans took out later, but less than half of their work was helpful to the enterprise.

When the United States decided to buy the rights of the French company for $40,000,000, the government of Colombia refused to ratify the necessary treaty. As a result, the state of Panama, with the help of the United States, declared itself independent of Colombia, and for $10,000,000 made a perpetual lease of a strip of land ten miles wide along the canal route, retaining only the cities of Panama and Colon. This strip is known as the Canal Zone (see below). After unsatisfactory attempts to dig a canal under private contract, the work was put in the hands of the army. With Colonel (later Major General) George W. Goethals in charge, the task was virtually completed in 1914, the first ship passing through the canal on August 3. General Goethals then resigned, but temporarily resumed his position when slides in 1915 interrupted traffic.

The original estimated cost, excluding sanitation, was $139,705,000, and the total cost exclusive of annual payments was $375,201,000. Of the sum, $40,000,000 was paid to the French company, $10,000,000 to Panama,



Photo U & U

EN ROUTE TO THE PACIFIC OCEAN

A view from the U S.S *Milwaukee* as a number of war vessels pass through the Pedro Miguel locks.

and $20,053,000 for sanitation; the remainder, $305,148,000, represents the cost of construction and general expenses. The number of laborers employed in 1912 and 1913, the highest at any one time, was over 40,000, of whom about three-fourths were West Indian negroes.

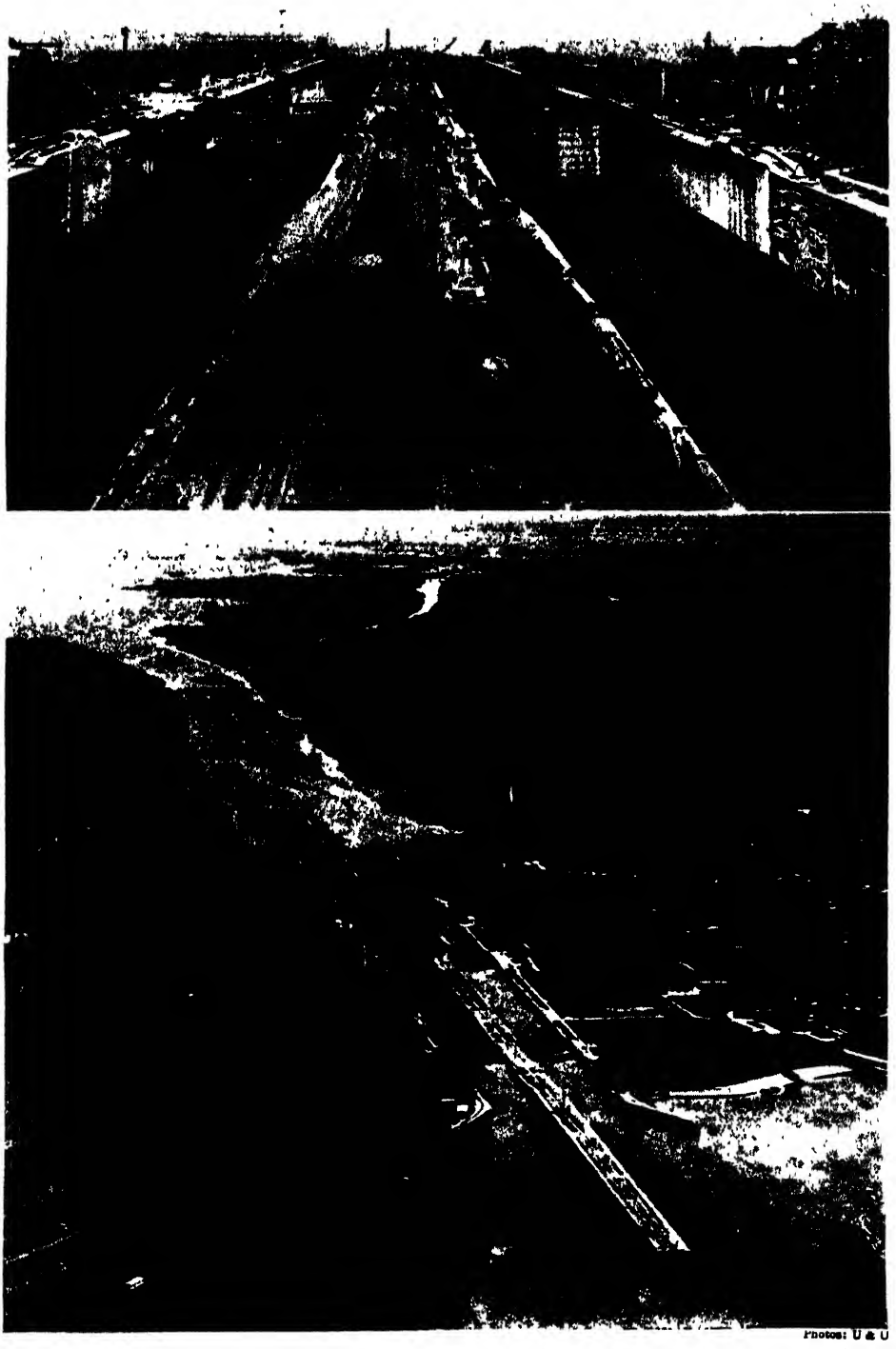
Sanitary Triumphs. When the Americans went to Panama, they found it "one of the hottest, wettest, and most feverish regions in existence." By the time the canal was completed, the Zone had a better record for health than many North American cities. This change was due to the untiring efforts of the sanitary department, under Major General Gorgas, who had previously performed a similar service for Havana. During the early stages of their task, the sanitary engineers cut down each year five square miles of brush, drained one-third of a square mile of swamp, cut ten square miles of grass, maintained 550 miles of ditches, destroyed 1,300,000 cans of garbage, and fumigated 11,000,000 cubic feet of residential space, all to stamp out the mosquito. It was the greatest fight against the pest that has been waged in the history of mankind.

Canal Tolls. The Hay-Pauncefote Treaty, signed by Great Britain and the United States, contained stipulations respecting a canal which might in the future be constructed across the Isthmus of Panama. It provided that—

. . . . the canal shall be free and open to vessels of commerce and war of all nations on terms of entire equality, so that there shall be no discrimination against any nation, or its citizens or subjects, in respect to the conditions or charges for traffic, or otherwise

When the Congress of the United States passed the Panama Canal Act, in 1912, which stipulated conditions of operation, there was written into the law a provision that American vessels engaged in domestic commerce should pass through the canal without payment of tolls. Great Britain protested against this proposed violation of treaty rights, and through the insistence of President Woodrow Wilson, in 1913, the offending clause was stricken from the act. The waterway was therefore dedicated to the use of all nations on equal terms, but this statement applies only to times of peace. In the event of war, the American government reserves the right of control of the canal; in its discretion, it may refuse its use to any nation.

Fortifications. Under the Hay-Pauncefote Treaty, the United States was forbidden to blockade the canal but not to fortify it. There was considerable discussion in both the United States and Europe concerning this right, and it was definitely settled in 1911, when the House of Representatives appropriated $3,000,000 for fortification. In a note from Sir Edward Grey, in 1912, the British government recognized the right of the United States to protect the canal. At both entrances of the waterway, fortifications have been built, and brigade



Photos: U & U

The Great Interoceanic Canal. At the top are shown the Gatun locks, where the canal enters Gatun Lake Below is an airplane view of the same locks, looking toward the Atlantic Ocean. The water in the foreground is the lake

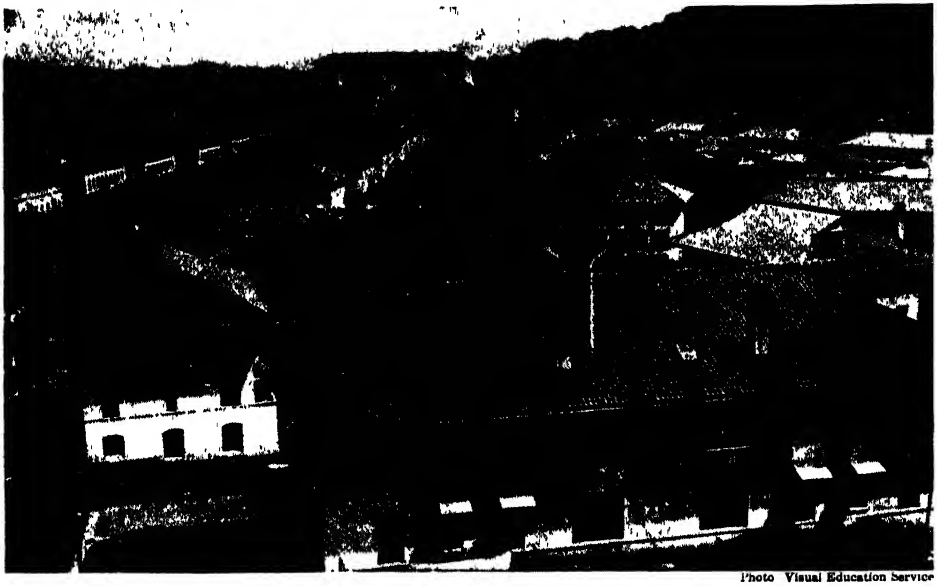


Photo Visual Education Service

VIEW OF BALBOA

The administration building of the Canal Zone is in the far background.

posts established near the locks. There are aerial forces from the army and navy, and at the Atlantic approach there is a base for submarines. There are 10,000 men in the entire military force.

Whom the Canal Benefits. During the discussion of the question of free passage for American ships bearing domestic commerce, it was declared that, unless the United States gave its own shippers some advantage, it would have spent about $400,000,000 only to benefit foreign nations. That this is far from being the case will be apparent from a study of the colored map accompanying this article. No other country, unless it be Canada, can hope to gain as great an advantage from the new route as the United States. Were there land in the middle of the Pacific, European nations would profit more than they do; as it is, Europe's route to China, Japan, and Australia through the Suez Canal is still its shortest path to the Orient, while New York, New Orleans, and Galveston are now nearer to Yokohama and Melbourne than are Liverpool and Hamburg. San Francisco, too, formerly three times as far as London from the West Indian islands by water, is now closer to most of them, while New York, previously the same distance from Peru, Ecuador, and Northern Chile as Genoa or French and English Channel ports, is now but half as far. Distances between ports, reckoned in days, before and after the completion of the canal, greatly favor the United States.

It seems strange to think of the Panama Canal as an internal waterway of the United States, and yet, from this point of view, it may prove even more valuable to the nation than as a highway for foreign trade. The very first year that the canal was open, canned fruits from California were carried through it on their way to Saint Paul by way of New York, and machinery from Saint Louis passed through New York on its way to the Pacific-coast states. The reason for this was economy. Steamboats can always carry goods much farther for the same charge than can freight trains, for steamboats have no expense for building and keeping in repair grades and tracks, tunnels and bridges. The railroads may temporarily meet the competition of the canal by reducing rates, but in many instances, they cannot do this; and when the Atlantic and Gulf cities have regular lines of steamers through Panama, and when improvements on the Mississippi and its tributaries are completed, this roundabout traffic will become still more common, and the benefits of the canal to the United States will increase.

The total cargo which passes through the canal yearly is more than 30,000,000 tons, and of the yearly averages, seventy-one per cent of the traffic is eastbound, because of the lumber of the Northwest, petroleum of California, exports from China and Japan, and products from the Pacific-coast canneries, especially the canned salmon from the Columbia River region.

A Trip Through the Canal. A strange fact about this canal, which joins the eastern and western oceans, is that, when one passes through it from the Atlantic to the Pacific, the comple-



THE CONTOUR OF THE CANAL COUNTRY
The structures suggested at the east and west ends of the canal are the great locks

tion of the journey finds him twenty-two miles east of his starting point. The Isthmus of Panama is thirty miles wide, and the canal extends south and then southeast, a distance of 40.5 land miles (from deep water to deep water is 50.5 miles). At the Atlantic, or Caribbean, end is the city of Colon (the Spanish word for Columbus), and at the other extreme lies Panama, the capital city of the republic.

A ship from New York bound for Pacific ports passes between the breakwaters, then steams south seven miles to the first lock, advancing most of its way through the channel which was dredged in the shallow waters of Limon Bay. Next, four, or perhaps six, powerful electric locomotives, running on tracks at the side of the canal, are attached to the boat, and pull it quietly into the lock, as soon as the gates are closed, the ship begins to rise to the next level. When the third lock has been passed, the vessel steams out into Gatun Lake, eighty-five feet above the level of the Caribbean. Each of the locks can accommodate a ship 1,000 feet long and 110 feet wide, and there is yet no boat in the world so large. The locks are built in pairs, so while westbound ships are climbing up the water stairway, eastbound ships may be descending it.

For the next thirty-two miles, the boat advances under its own power, winding south and east between the hills that edge the valley of the Chagres River, then plunging into the backbone of the isthmus through the famous Culebra Cut, eight miles long. Before the Americans reached Panama, the Chagres was only a mountain torrent, but near the top of the three Atlantic locks, called the Gatun locks, has been built the Gatun Dam, which holds back the waters of the river so that they form a lake of 164 square miles. The lake channel through which the ships pass is from 500 to 1,000 feet wide.

The Culebra Cut (*culebra* means *snake*) is now officially called the Gaillard Cut, in honor of Colonel Gaillard, who directed the work of digging it. The hill at Culebra was the greatest obstacle which the canal-builders faced. It is formed of soft volcanic material, and excavating in it resembled in some respects digging water. When a hole was made, more rock and dirt would slide into it from the side, or be thrust up from below by the weight of the hills. Even after the canal had been opened, the slides continued, and the canal was blocked from September, 1915, to April, 1916. On the whole, instead of removing 53,000,000 cubic yards, as originally estimated, the engineers took out 135,000,000, enough to make a sandpile nearly twice as high as the Woolworth Building, and over half a mile broad at its base. Thus the cut became three times as wide at the top as had been planned.

Just beyond Gaillard, the ship is lowered through Pedro Miguel lock into little Miraflores Lake, which is thirty and one-third feet lower than Gatun Lake, and a mile and a half farther it sinks to sea level in the two Miraflores locks Eight miles beyond the last lock, the open Pacific is reached, after a voyage of ten hours to twelve hours from the Caribbean. The time required to pass a vessel through the locks is three hours, approximately an hour and a half for each set, and the average time spent in filling and emptying a lock is fifteen minutes, care being taken not to open the valves so suddenly as to create disturbing currents in the locks or approaches. Sea level, however, does not mean the level from which the ship originally came, for on the Atlantic side there are only a few inches of tide, but at the Pacific end, the water rises and falls, on the average, eight feet.

Panama Railroad. New Granada (now Colombia) recognized the advantages and need of a railroad across this narrow isthmus as early as 1828, when it engaged engineers to survey possible routes. Settlement of the American Northwest and discovery of gold in California renewed enthusiasm for a new and shorter route to the West than the long trip

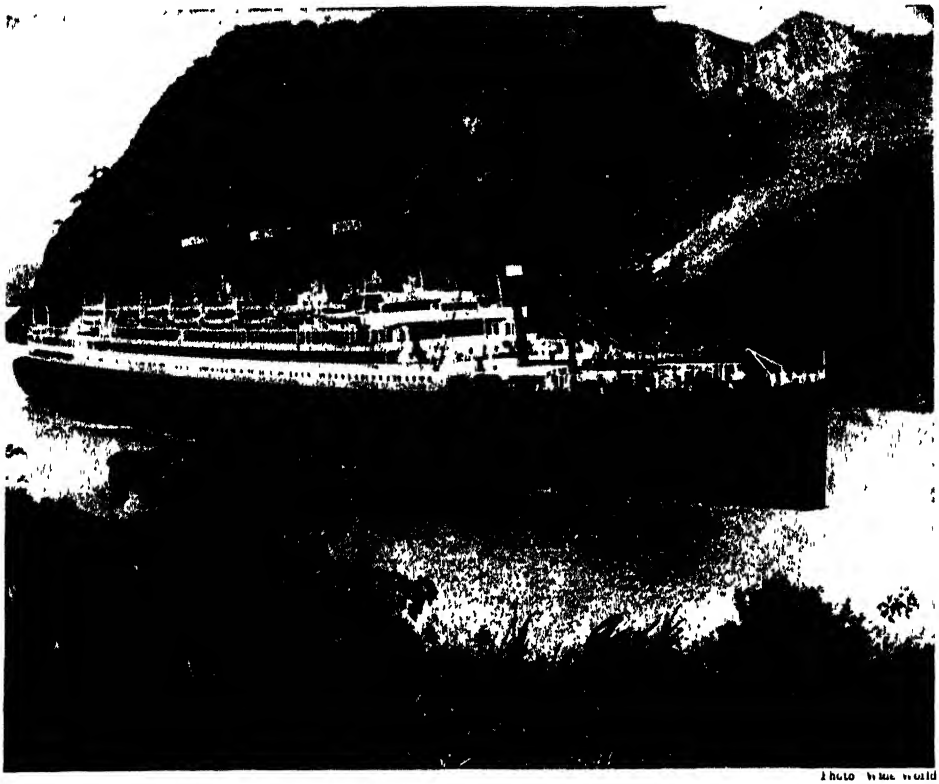


Photo Wide World

A GREAT STEAMER PASSING THROUGH THE CANAL

around Cape Horn, and it was three Americans, John L. Stephens, William H. Aspinwall, and Henry Chauncey, who received a franchise from New Granada in 1848 to construct the railroad. The road, forty-eight miles in length, was completed in 1855, and cost $7,000,000.

Concessions to the Panama Railway Company gave the exclusive right to construct a railway or canal in a certain territory, dated ninety-nine years from 1867. This gave complete control of the Panama route, and when the French company was organized to construct a canal, the promoters found they must first acquire control of the railroad, which cost them $20,000,000. When the United States took over the building of the canal, it nominally purchased the Panama Railroad, its franchises, and all its rights from the French company, and $7,000,000 of the $40,000,000 paid for the canal was the amount assigned for the railroad. Thus, through these rights and franchises, the United States is owner of the land in Panama, but according to the franchise, it may not sell it. The United States rebuilt the railroad, using more modern methods, raising the level of the tracks to accommodate a lock-type canal, making it double track, and building the necessary tunnels

The Canal Zone. Stretching across the republic of Panama is a narrow strip of United States territory, in the center of which runs the canal. This zone is ten miles wide—five miles in width on each side of the canal, and about forty-seven miles in length. The United States was granted this land by the treaty made with Panama only a few days after the latter gained its independence, and was ratified by the United States Senate three months later, in February, 1904. By this treaty, the United States is granted in perpetuity the "use, occupation, and control" of this region, and "all the rights, power, and authority which it would possess were it the sovereign of the territory, to the exclusion of the exercise of sovereign rights by the republic." The cities of Panama and Colon are not under United States jurisdiction except in respect to the provisions for sanitation and quarantine (see above). In return for these rights, the United States paid Panama $10,000,000 and an annual rental of $250,000 beginning in 1913, and agreed not to sell the land to private individuals.

The Canal Zone is a military reservation under control of the Department of War. The administrative officer is a governor, who

is appointed from the personnel of the United States army by the President of the United States and confirmed by the Senate. General Goethals, the canal-builder, was the first governor, and Colonel Harry Burgess assumed office October 16, 1928.

The government of Colombia has never quite forgiven the United States for its part in the Panama revolution, and has been quite reluctant to recognize the independence of Panama. A treaty drawn up in 1914 by William Jennings Bryan, then Secretary of State, contained an apology, gave Colombian citizens the same rights as United States citizens in the Canal Zone and the Panama Canal, and provided a payment of $25,000,000 as compensation for the loss of territorial sovereignty. The American Senators were indignant at the apologetic tone, and the treaty was modified and finally ratified in 1922. The first installment of $5,000,000 was paid in the fall of 1922, and the last in 1926.

In 1928 Congress authorized the building of a dam at Alhajuela on the Chagres River, which will create a reservoir covering twenty-two square miles, with a storage capacity of 22,000,000,000 cubic feet of water. The dam will be 170 feet high and cost about $12,000,000, requiring about five years for building. J.F.M'K.

Related Subjects. Much additional information respecting the Panama Canal will be found in these volumes in the following articles

Goethals, George W	Panama (republic)
Gorgas, William C	United States (subhead)
Hay-Pauncefote Treaty	Wilson, Woodrow (Administration)
Lesseps, Ferdinand de	
Mosquito (Canal subhead)	

PANAMA HATS. See COLOMBIA (Mining and Manufactures).

PANAMA-PACIFIC INTERNATIONAL EXPOSITION, an exposition held in San Francisco in 1915 to celebrate the completion of the Panama Canal. The site chosen lay along the south water front of San Francisco Bay, adjacent to the Golden Gate. The grounds, 635 acres in extent, sloped toward the bay and were surrounded by an amphitheater of hills. To the north they looked out across the bay to the hills and mountains beyond. To the west was the Presidio, a United States military reservation, and on the east was Fort Mason.

The work of planning the grounds and buildings was delegated to a board of architects, with Jules Guerin as colorist. In the center they placed the Court of the Universe, designed by McKim, Mead, and White, with a sunken garden which had a seating capacity of 7,000. To the east was the Court of Abundance, with its ornamentation representing Oriental art and architecture; to the west was the Court of the Four Seasons, which typified Western civilization.

Around these courts were grouped the buildings, which were covered with artificial travertine. This gave them the color of old ivory. The crowning feature of the architectural scheme was the Tower of Jewels, designed by Carrere and Hastings, 433 feet high and decorated with 125,000 glass prisms of all colors and hues, so mounted that they were set in motion by the faintest current of air. The sculpture adorning the buildings and grounds was of the highest order. Of the larger pieces, the group over the entrance to the Court of Abundance, representing the nations of the East, and that over the entrance of the Court of the Four Seasons, representing the nations of the West, were especially noteworthy, as were also several single pieces, such as the *End of the Trail* by Fraser, the *Adventurous Bowman* by MacNeil, and *Victory* by Mary Evelyn Longman.

About forty states and territories and thirty-six foreign nations were represented by exhibits, all of which were essentially modern, since nothing was listed for award that had not been invented or developed since the exposition at Saint Louis in 1905. The total cost of the exposition was over $50,000,000, of which $7,500,000 was raised by popular subscription in San Francisco, $5,000,000 by tax levy voted by the state, and the remainder by bond issues, tax levies, and sums borne by out-of-state and foreign exhibitors. Congress wished to show the development and progress of the government, and voted $500,000 for a building, and an equal amount for exhibits of the departments in Washington. The value of the exposition, including exhibits, was estimated at $350,000,000 The average daily attendance was over 60,000, and, contrary to the usual outcome of such enterprises, the exposition was a financial success.

PAN-AMERICAN CONGRESS, OR CONFERENCE, a term applied to a gathering of delegates from the various republics of North and South America, for the purpose of establishing better trade relations and promoting friendly feeling. The first conference of independent American countries was held at Panama in 1826 at the instigation of Simon Bolivar, who was eager to see some form of union among the Spanish colonies of Central and South America. The United States was invited by the governments of Mexico and Colombia to send representatives to the congress, but the proposal caused such wrangling and disagreement in the Senate and House of Representatives that by the time a decision was reached and delegates dispatched, the congress had adjourned without accomplishing its purpose.

Other conferences were held in 1847, 1864, and 1878, in which South American countries and usually one Central American state were

represented. Outside of a few treaties or agreements on commercial problems, international law, and extradition, little was accomplished. The first Pan-American Congress met in Washington October 2, 1889, and every American republic except Santo Domingo was represented. Many recommendations were made concerning free navigation of American rivers, standards of coins and measures, and international banking, but the only practical outcome was the organization of the International Bureau of American Republics, later renamed the Pan-American Union (which see).

The Congress of 1901-1902. The second congress met in the City of Mexico on October 22, 1901. Among the specific suggestions made was that there should be a railroad constructed to connect North and South America. A uniform system of quarantine was favored, and the adoption of a coin to be accepted as legal tender by all American republics. A plan for arbitration patterned after that of the Peace Conference at The Hague was adopted.

The Congress of 1906. The third conference assembled at Rio de Janeiro. The discussion of the Drago, or Calvo, Doctrine was one of the most important matters that came before the body. This doctrine denies the right of governments to collect private debts by force. It was finally referred to The Hague. Other topics which were discussed were the Pan-American railway, the regulation of patents, sanitation, the codification of laws, and commercial relations.

The Congress of 1910. The fourth congress opened in Buenos Aires in July. It avoided committing itself in support of the Monroe Doctrine. Considerable difference of opinion developed in the committee on sanitation, Venezuela objecting to the proposal supported by the United States, that the condition of ports of departure should be such as to satisfy the nations receiving shipments that they are not menaced by contagious or infectious diseases. A resolution was offered recommending that the members of the congress agree to submit to arbitration all claims for damages presented by their respective citizens which cannot be adjusted by ordinary diplomacy. The name of the International Bureau of American Republics was changed to the PAN-AMERICAN UNION. (See that title for later information bearing upon the commercial and friendly relations between the two Americas.)

The Congress of 1923. The fifth congress opened at Santiago, Chile, on March 26, 1923. All the American republics were represented except Mexico, which was not at that time recognized by the United States, and Peru and Bolivia, which had disagreements with Chile. The chief object was to establish closer relations between the American states, and the success of this aim is questionable when one reviews the disagreements on the limitations of naval armaments, which threw Argentina, Brazil, and Chile into such discord. The United States failed to support Uruguay's proposal that the principle of the Monroe Doctrine be adopted by all the American states, for the United States realized that it would be called upon to bear the financial and military brunt of the enforcement. Of the many resolutions which were passed, the most important provided for four permanent committees to assist the Pan-American Union, one for commercial relations, another on the international organization of labor, a third on hygiene, and the last on education and the development of intellectual coöperation through an exchange of professors and students from the universities.

The Congress of 1928. The sixth congress was held at Havana, Cuba, from January 16 to February 20, 1928. President Coolidge honored the meeting by making it his first visit to foreign soil while President, and Charles A. Lindbergh also added distinction by his presence. The American delegation was headed by Charles E. Hughes, whose knowledge of international law, tact, and ability made the conference a successful and happy one. Among the accomplishments of the meeting was a resolution outlawing aggressive war and recommending peaceful settlements of disputes; treaties involving a code of international law for the American republics; and provisions for commercial aviation.

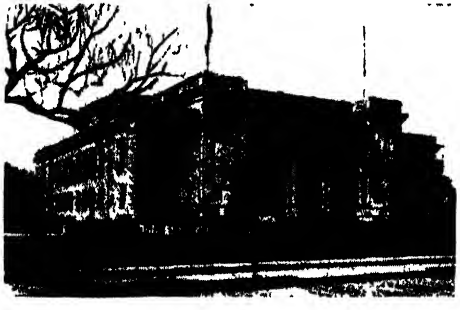
Twice during the conference, Mr. Hughes met unusually difficult situations with such tact and diplomacy that he saved the conference from the discord and futility which have marked all others. He answered Dr Gustavo Guerrero's attack on the United States policy of military intervention in Central American states by explaining that the action was based purely on the principles of good will and coöperation, and not in the spirit of imperialism. In another effective speech, he thwarted the efforts of Dr Honorio Pueyrredon, head of the Argentine delegation, to force a declaration for tariff equality into the preamble of the convention reorganizing the Pan-American Union.

PAN-AMERICAN EXPOSITION, an exposition held in Buffalo, N. Y., in 1901 to celebrate the progress made in industries, science, and art by American republics during the nineteenth century. It occupied 350 acres in the northern part of the city, and its main buildings were grouped around a broad court. An electric tower, 409 feet high, was the center of the architectural scheme, which was an adaptation of the Spanish Renaissance. Electrical power was derived from Niagara Falls. On account of its decoration and

elaborate coloring, the fair was called the "Rainbow City." Eighteen countries were represented. The Federal government spent $500,000 on special exhibits. The New York state and Art buildings were permanent, and are now devoted to the collections of the Albright Art Gallery and Buffalo Historical Society. President McKinley's assassination occurred on September 6, during a reception in the Temple of Music of the exposition, and he died eight days later.

More than 8,000,000 people attended the exposition, and the cost was estimated at about $8,800,000, of which only a part was covered by the total receipts. Congress made an appropriation to take care of most of the deficit.

PAN-AMERICAN UNION, an international organization maintained by the twenty-one republics of North, Central, and South America, for the promotion of friendly commercial rela-



PAN-AMERICAN UNION BUILDING
In Washington, D. C.

tions, good understanding, and preservation of peace among these countries. All American countries except Canada and Guiana are represented. It was established in 1890 as the International Bureau of American Republics, but its name was changed to the present form in 1910. Its foundation was the result of the Pan-American Congress of 1889, which recommended the organization of a "bureau of information for the dissemination of intelligence concerning the commerce and resources of the American republics." Through its monthly publication, the *Bulletin of the Pan-American Union*, and also its annual report, both of which are authoritative documents, printed in English and Spanish, the Union now transmits information concerning commercial conditions and opportunities, changes in customs laws and in patent and trade-mark regulations, and generally acts as publicity agent for all the republics in their relations to each other.

Two of the expressed objects of the Union are to secure the adoption of a common coinage basis and the arbitration of all disputes between the various governments involved. This attitude toward arbitration received an impetus in 1914, when representatives of Argentina, Brazil, and Chile acted as arbitrators between Mexico and the United States [see MEXICO (Government and History)].

The headquarters of the Union, in Washington, D. C., are in a beautiful building, completed in 1910 as the gift of Andrew Carnegie. The Secretary of State of the United States is *ex officio* chairman of the governing board of the Union, whose remaining members are the ambassadors and ministers of the other republics to the United States. By a new provision, made at the Pan-American Congress in 1923, any American country not having an accredited representation at Washington may appoint a special representative on the board. This was to remove the objection of the Latin Americans that the United States was restricting the membership to those it approved and accepted for its diplomatic relations. The board elects the director-general, who assumes executive control. The financial support is contributed by each country according to quotas based on their population.

PANAMINT, *pan' ah mint,* **MOUNTAINS.** See DEATH VALLEY.

PANAY, *pah ni'.* See PHILIPPINE ISLANDS (Some of the Islands in Detail)

PANCAKE TUESDAY. See SHROVE TUESDAY.

PANCREAS, *pang' kre as,* an important digestive organ which takes part in the digestion of proteins, starches, sugars, and fats. It is a long, narrow gland, six or eight inches in length, about one inch thick, and an inch and a half wide, and is of a pinkish-yellow color. It lies crosswise and behind the stomach, and communicates with the intestinal tract by means of a duct which extends throughout its length. The contents of this duct are discharged into the duodenum, which meets the pancreas at the right end of that gland.

Scattered throughout the pancreas are small islands of glandular tissue, which pour their secretion into the blood stream rather than into the intestine. These areas are called the *islands of Langerhans*, and they furnish the internal secretion of the pancreas, known as *insulin*. This substance, discovered only recently, is very important in the combustion of the sugar circulating in the blood stream. If there is insufficient insulin formed by the pancreas, the sugar in the system is not burned, but accumulates in the blood stream and body tissues. This condition gives rise to the disease known as *diabetes mellitus*. K.A.E.

[*Sweetbread*, a delicacy sold by butchers, is either the pancreas or the thymus (a neck gland) of a calf or other animal.]

Related Subjects. The reader is referred to the following articles

Diabetes	Insulin
Digestion	Zoölogy (How Zoölogy
Glands (Ductless Glands)	Affects Human Welfare)

PANCREATIN, *pang' kre a tin,* a yellowish-white powder given to invalids and old people as a digestive agent. It is a mixture of the elements, or ferments, found in the pancreatic juice, and is usually taken from the pancreas of a hog or ox six hours after a meal, when the organ is most active. Natural pancreatin contains *trypsin,* a ferment which digests meat, eggs, and other proteids; *amylopsin,* which turns starch into sugar; *steapsin,* which emulsifies fats; and the enzyme which curdles milk. In the stomach, pancreatin is destroyed by the gastric juice, but is given by some physicians to persons having forms of stomach trouble accompanied by suppression of hydrochloric acid, which is found in the digestive juices. See PANCREAS; DIGESTION.

PANDA. See RACCOON.

PANDEMIC, *pan dem' ik.* See EPIDEMIC.

PANDORA, in Greek mythology, the first woman created. Jupiter was so angered at Prometheus, because the latter had stolen fire from heaven, that he resolved to avenge himself upon man. So he called upon Vulcan to fashion a being in godlike form from earth and water. All the gods joined in endowing the new being with attractive qualities or those qualified to make mischief. Minerva gave her artistic knowledge, Venus contributed beauty, and Mercury made her artful and designing. The Graces and the Seasons clothed her, and Jupiter christened her Pandora, or *all-gifts.*

Thus endowed, the new creation was sent to Prometheus, who received her coldly, for he was suspicious of gifts from the gods. Then Mercury took her to Epimetheus, who was much more trustful than his brother. He married her and was happy until Mercury brought a box which he confided to the care of Pandora, with strict injunctions that she should not open it. Her curiosity, however, was too strong, and she undid the fastenings. Then at once there burst out all the vices, sins, crimes, and sufferings that can afflict man, for Jupiter had included in its contents all the ills of the world. Frightened at what she had done, Pandora hastily shut down the lid in time to retain and preserve for man Hope, which always follows suffering, and is the chief consoler of the race. Other legends tell the story somewhat differently, but all versions leave the main statements unchanged.

Related Subjects. An idealized illustration of Pandora's box appears in the article MYTHOLOGY. In their alphabetical order, see the various important gods and goddesses referred to above.

PANEPIDEMIC, *pan ep ih dem' ik.* See INFLUENZA.

PANGKOR, ISLAND OF. See STRAITS SETTLEMENTS.

PANHANDLE, a name popularly applied to Southern Alaska, to Northwestern Texas, and to Northwestern Oklahoma. See ALASKA; TEXAS; OKLAHOMA.

PANHANDLE STATE, a popular name applied to West Virginia. See WEST VIRGINIA (Items of Interest).

PANIC. See JACKSON, ANDREW, page 3602; GRANT, ULYSSES S., page 2904; CLEVELAND [STEPHEN] GROVER, page 1471.

PANKHURST, EMMELINE (1858-1928), an English militant suffragist widely known for her spectacular methods and intense devotion to the cause of equal suffrage Her father, Richard Goulden, and her mother zealously advanced the doctrine of votes for women when the movement in England was in its infancy. Their daughter Emmeline was born in Manchester and educated there and in Paris. In 1870 she married Dr. Richard Marsden Pankhurst (died 1898), and became the mother of five children. She was one of the founders of the Women's Franchise League, organized in 1889, and of the powerful Woman's Social and Political Union, founded in Manchester in 1903. It was about two years later that she and her followers inaugurated militant tactics in furtherance of their cause.



Photo Brown Bros.

EMMELINE PANKHURST

At first this militancy was comparatively mild, consisting of "heckling" public speakers, the organization of monster parades, and various demonstrations regarded merely as disturbances of the peace, but after 1912, when the hostility of the Cabinet to the cause was apparent, a new campaign was inaugurated. The militants began to set fire to buildings, damage golf links, pour noxious fluids in mail boxes, and break the windows of public edifices. Mrs. Pankhurst, the chief instigator of these outrages, was sent to jail early in 1913 as an accomplice in a plot to destroy Lloyd George's country home with a bomb, but she was as troublesome in jail as out of it. Hunger strikes and enforced feeding seriously injured her health, and she was soon released, only to be committed for a new outrage. This "cat and mouse" policy continued until the summer of 1913, when Mrs. Pankhurst succeeded in making her way to Paris. From there she sailed to America, where she engaged in a lecture tour before returning to England. During the World War, militant tactics were omitted because of patriotic sentiment, and

in 1918, when partial suffrage was granted to English women, the suffragettes saw their aim largely accomplished. In 1930 a monument to her memory was unveiled in London.

Mrs. Pankhurst's two daughters, Sylvia (born 1882) and Christabel (born 1880), were both active workers for political equality.

PANKHURST, SYLVIA, daughter of Emmeline Pankhurst. See above.

PANNONIA, *pah no' nih ah.* See GOTHS (The Ostrogoths).

PANSY, *pan' zie,* the "flower with a face," is a cultivated species of violet. There is a charming story about its origin. Nearly three centuries ago, in Europe, someone carried wild violets, which he loved, to a cool, moist spot in a garden. There, sheltered from strong winds, warmed by the morning sun, and fed by rich soil, the plants grew larger and more beautiful. As the years passed by, continued selection and breeding wrought further changes, until to-day we have the exquisite, velvety blooms of purple, violet, blue, yellow, white, and brown. Pansies are so hardy they can be easily grown in the home garden. They require plenty of water and some shade, for a hot sun is apt to wither them.



Photo: Visual Education Service

The many nicknames bestowed on the pansy testify to the universal affection it inspires. Some of these are "jump-up-and-kiss-me," "heartsease," "three faces-under-a-hood," and "love-in-idleness." The French call it *pensée,* meaning *thought.* Ophelia's speech, in *Hamlet,* is well known: "There's rosemary, that's for remembrance;—there is pansies, that's for thoughts." See VIOLET. B.M.D.

Of all the bonny buds that blow
In bright or cloudy weather,
Of all the flowers that come and go
The whole twelve moons together,
The little purple pansy brings
Thoughts of the sweetest, saddest things.
—BRADLEY, *Heart's Ease*

Classification. The violet family is *Violaceae* The pansy is a descendant of *Vsola tricolor*

PANSY, a pen name. See ALDEN, ISABELLA MACDONALD.

PANTALOON. See PANTOMIME.

PANTHEISM, the belief that God and the material universe are one and the same thing, and that God does not exist as a separate spiritual being. The Dutch philosopher, Baruch Spinoza (which see), was the most prominent of modern scholars who accepted this doctrine. In the poetry of Bryant, Wordsworth, and other nature poets, there are suggestions of a pantheistic view of God and the world.

The following lines from Wordsworth's *Tintern Abbey* are a good example of this view:

. . . . . For I have learned
To look on nature, not as in the hour
Of thoughtless youth; but hearing oftentimes
The still, sad music of humanity,
Nor harsh nor grating, though of ample power
To chasten and subdue. And I have felt
A presence that disturbs me with the joy
Of elevated thoughts; a sense sublime
Of something far more deeply interfused,
Whose dwelling is the light of setting suns,
And the round ocean and the living air,
And the blue sky, and in the mind of man;
A motion and a spirit, that impels
All thinking things, all objects of all thought,
And rolls through all things Therefore am I still
A lover of the meadows and the woods,
And mountains; and of all that we behold
From this green earth; of all the mighty world
Of eye, and ear,—both what they half create,
And what perceive, well pleased to recognize
In nature and the language of the sense,
The anchor of my purest thoughts, the nurse,
The guide, the guardian of my heart, and soul
Of all my moral being

Derivation of Term. The term *pantheism* is sometimes used in the sense of *worship of many gods* It is derived from two Greek words meaning *all* and *god.*

PANTHEON. The finest architectural work of the ancient Romans, and the best-preserved of their buildings that time has spared, is the Pantheon of Rome. The name means *of all the gods,* and was applied by the Romans to any temple dedicated to all their deities. The famous Pantheon of Rome is on the site of a temple built in 27 B.C. This edifice was struck by lightning in the reign of Trajan. Hadrian, in A.D. 123, built the existing structure, but it was subsequently altered and improved by Septimius Severus and Caracalla. It is circular in form, 142½ feet in interior diameter, and possesses a great dome, the apex of which is 142 feet above the floor. The only light which enters the building comes from

a window, twenty-seven feet in diameter, at the summit of the dome. A most striking feature is the portico with its sixteen great

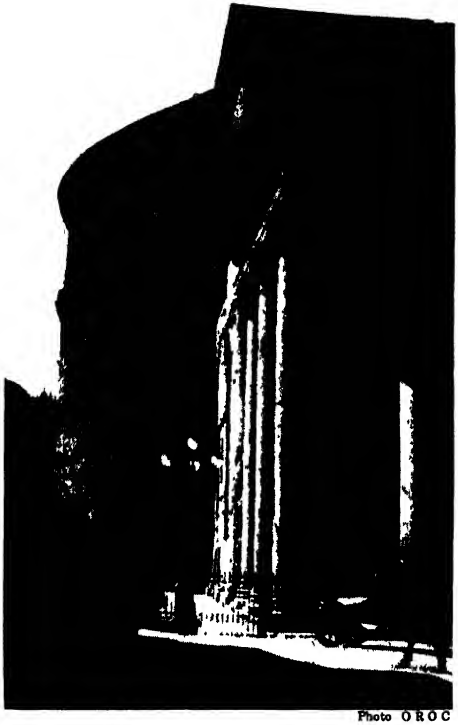


Photo ORC

THE PANTHEON AT ROME

Declared to be the most perfect of the ancient buildings of the city It has become a burial spot for writers and artists

Corinthian columns, each hewn out of a single stone. The portico is the only part of the



A HERITAGE FROM THE ROMAN EMPIRE

The Pantheon of Agrippa, rebuilt by Hadrian (117-138 A.D.)

temple built of the original materials. The Pantheon is in an almost perfect state of preservation, and has been used since the seventh century as a Christian church. Raphael, Annibale Carracci, Victor Emmanuel II, and Humbert I are among the great Italians buried there.

Among modern buildings which bear this name, the most celebrated is the church in Paris which is more correctly styled the Church of Saint Geneviève. The rabid Revolutionists desecrated the building, and to show their contempt for Christianity and their preference for the heathen faith, called it the Pantheon. It was twice reconsecrated as a church, but since 1885 has been used as a national burial place. In the crypt are the tombs of Mirabeau, Marat, Voltaire, Rousseau, Victor Hugo, and other notables. This structure is a perfect example of classic architecture, and the interior is decorated with many striking historical paintings

PANTHER, a name used somewhat loosely to designate certain members of the cat family It is applied to the *leopard*, which is a native of Asia and Africa, and to the *puma* of North America, known also as the *cougar* and the *American lion*. Some authorities apply the name only to large leopards, but this distinction is not commonly observed. M.J H

Related Subjects. Full descriptions of the leopard and the puma will be found in these volumes under their proper headings For illustration of members of this family, see the article CAT

PANTOMIME, *pan' toh mime*, a term derived from Greek words meaning *all mimic*. It was not, at first, the name of a kind of play, but signified the actors. To mimic by action is a necessary element in dramatic representation, other elements being narrative, music, dancing, etc.; one way of classifying dramatic performances is the relative importance of these elements. In an opera, singing, music, and dancing are expected, but there is little spoken narrative. In early days, pantomime was the name of a class of performances in which mimicking by gesture was the important element

It cannot be told where pantomime was first employed; it reached widely different stages of development at different times and places. In the first age of the Roman Empire, it was very popular; no narrative was employed, the play being acted out by gesture and dancing, accompanied by music, and the actors wore masks. The mimicry was so skilful that the story was well understood by the audience.

In the pantomime so much in vogue in England during the eighteenth century and later, the actors always represented conventional characters and names. There was always a *Harlequin*, or clown; an amiable but stupid father, *Pantaloon*; a sprightly daughter, *Columbine*; and so on. The performance was of the vaudeville order, interspersed with music, dancing, and acrobatic

feats. The subject matter of the play was some folklore story like *Jack the Giant Killer.* To-day, the term refers almost wholly to a short play in which there is no spoken word; the moving-picture stories thrown on the screen are good examples of pantomime.

PANTOPTIKON. See MOVING PICTURES.

PAPAGO SAGUARO, *pah' pah go sah-gwah' ro.* See MONUMENTS, NATIONAL.

PAPAL, *pa' pal,* **BAN.** See BAN.

PAPAL GUARD. See SWISS GUARDS.

PAPAL INSIGNIA. See POPE (Insignia of Office); RING.

PAPAL STATES, OR STATES OF THE CHURCH. When, in February, 1929, Pope Pius XI and Mussolini concluded a treaty of reconciliation and a concordat, the temporal power of the Roman Popes was restored after a period of nearly sixty years. For over eleven centuries, from 755 to 1871, the Popes had direct control of several provinces and cities, including Rome, in the central part of Italy. This section was known as the Papal States, and the authority of the Popes over these Church States was the visible sign of their temporal power. A part of this territory was originally given to Pope Stephen II by Pepin the Short of France, who wrested it from the warring Lombards. Charlemagne, Pepin's successor, confirmed and enlarged the gift, and was in turn crowned in spectacular magnificence in Rome by Pope Leo III and given the support of the Church in his campaign for power in Western Europe.

This interchange of authority worked very well during the lives of Charlemagne and Leo, but led to endless strife between the Popes and kings of later centuries. After the Reformation, the political power of the Pope gradually declined, and in 1860 the Papal States, with the exception of the land immediately about Rome, became subject to Victor Emmanuel II, King of Italy. Ten years later, Victor Emmanuel entered Rome and asked the citizens to decide by popular vote whether or not the city should become the capital of a united Italy. The electorate having decided in the affirmative, Pope Pius IX shut himself up in the Vatican and thenceforth regarded himself as a prisoner. The Popes who followed pursued this policy, until the agreement between Pius XI and Mussolini brought about the organization of an independent Papal State. The main points of the agreement are as follows:

The treaty reaffirms the principle contained in the first article of the Constitution of the Italian kingdom, by which the Catholic Apostolic Roman religion is the only state religion in Italy.

The treaty recognizes the full property and exclusive dominion and sovereign jurisdiction of the Holy See over the Vatican as at present constituted.

For this purpose, the City of the Vatican (105 acres) is created, and in its territory no interference by the Italian government will be possible, for there will be no authority but the authority of the Holy See

The Vatican territory will always be considered neutral and inviolable.

The Italian government accepts the canon law in cases of marriage, separation, and other matters over which the Church has jurisdiction.



THE FORMER PAPAL STATES

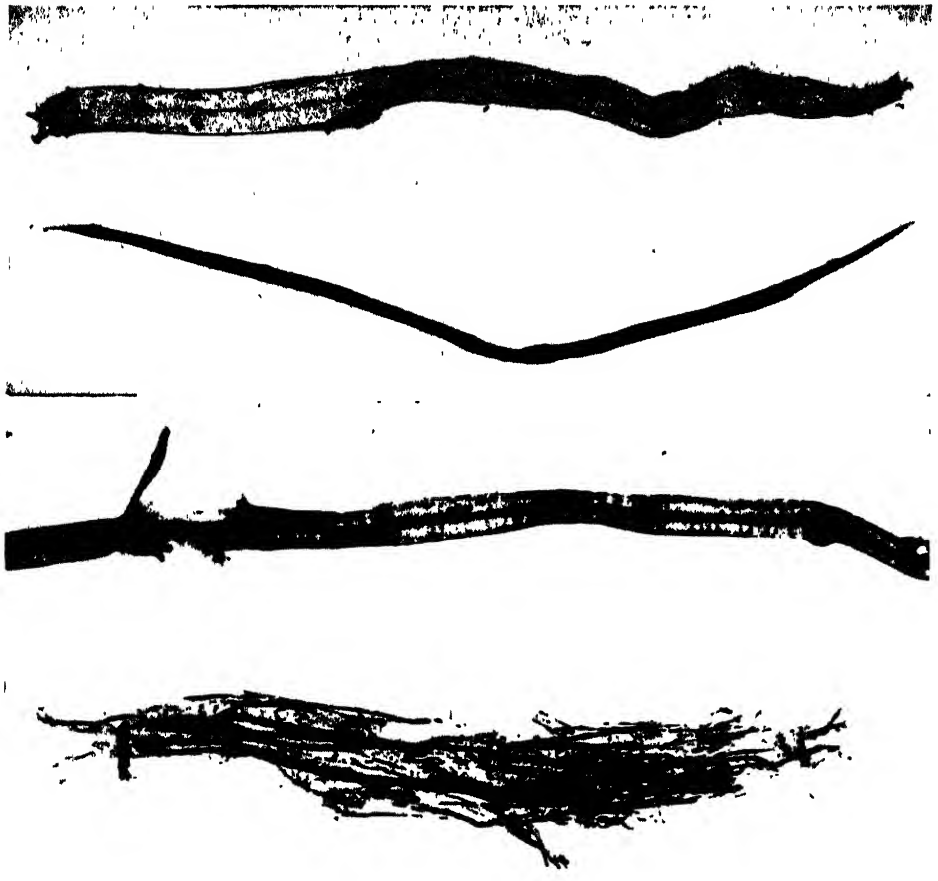
The Holy See, as a definite settlement of all its financial relations with Italy in consequence of the fall of temporal power, accepts 750,000,000 lire cash (about $37,500,000) and 1,000,000,000 lire (about $50,000,000) in Italian State consols at five per cent.

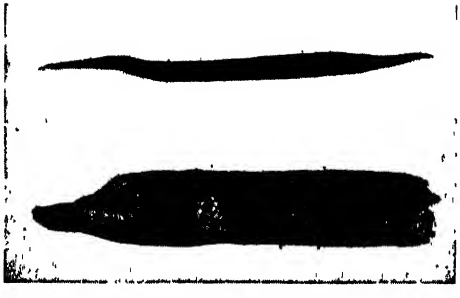
[See ITALY (History The Unification of Italy); VATICAN CITY]

PAPAW, *pa paw'* or *paw' paw,* a form of the word *pawpaw* (which see), the latter form being more popular.

PAPEETE, *pah pay a' tay.* See PACIFIC ISLANDS (Society Islands).

PAPER. Every country lad has had experiences with wasps and hornets, but boys have probably never looked upon these troublesome insects as the first paper-makers. However, a careful examination of a wasp's nest will convince one of this fact, and it is said that the study of one of these nests first suggested (to the Chinese) the possibility of the use of wood for making paper. Paper is so common in every household that we seldom consider its value, yet what would we do without it? If we were deprived of paper, the printing industry could not continue; we would have no more newspapers, books, or magazines, and some other substitute would have to be found for wrapping parcels.



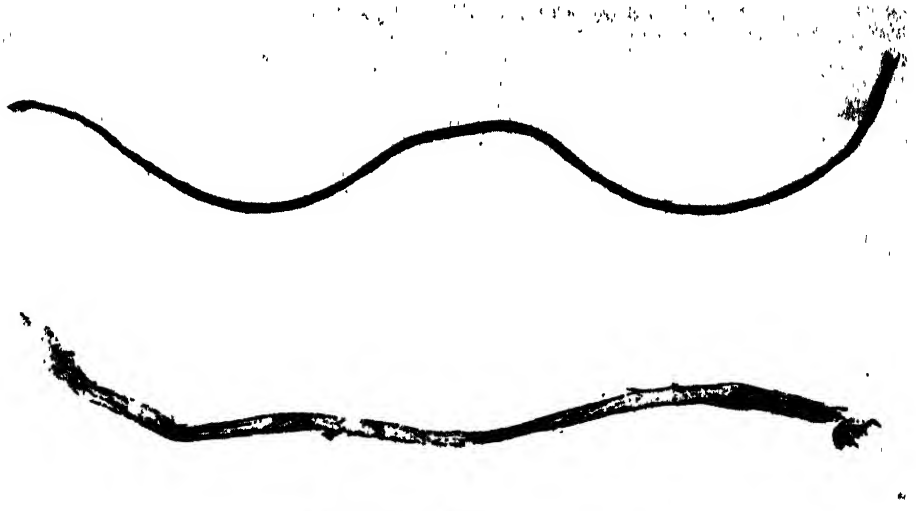


SPECIMENS OF PULP FROM VARIOUS KINDS OF WOOD
The fourth illustration is that of ground wood before it is bleached. All the specimens are magnified

Paper, which has become one of the world's most useful commodities, is the result of centuries of study, experiment, and invention. It has always been associated with man's intellectual development, and its invention is due to repeated attempts to produce a substance on which man's thoughts and achievements could be recorded. The first of these attempts of which there is any record was that of the ancient Egyptians, who prepared from the stems of the papyrus plant a tissue on which they recorded the deeds of their rulers and other royal personages. Many of these ancient records, called *papyri*, have been found in Egyptian tombs.

A king in the ancient country of Asia Minor, unable to obtain papyrus, returned to a former custom of preparing the skins of goats, sheep, and calves as "writing paper." This material was called *parchment*.

The Chinese manufactured paper at least two centuries before the birth of Christ, and passed on their secret to the Arabs, who introduced the art into Spain in the middle of the twelfth century. This early paper is referred to by writers of the period as cloth parchment, now known as *vellum*. By the second half of the fourteenth century, crude handmade paper for literary purposes had become general in Western Europe, and vellum was gradually



PULP FROM RAGS, USED IN MAKING HIGH-GRADE PAPER

driven out. The earliest preserved English manuscript bears the date of 1309, but paper was not manufactured on the island until the beginning of the sixteenth century. In America a mill was set up near Philadelphia in 1690, but a good many years elapsed before paper-making machinery was perfected.

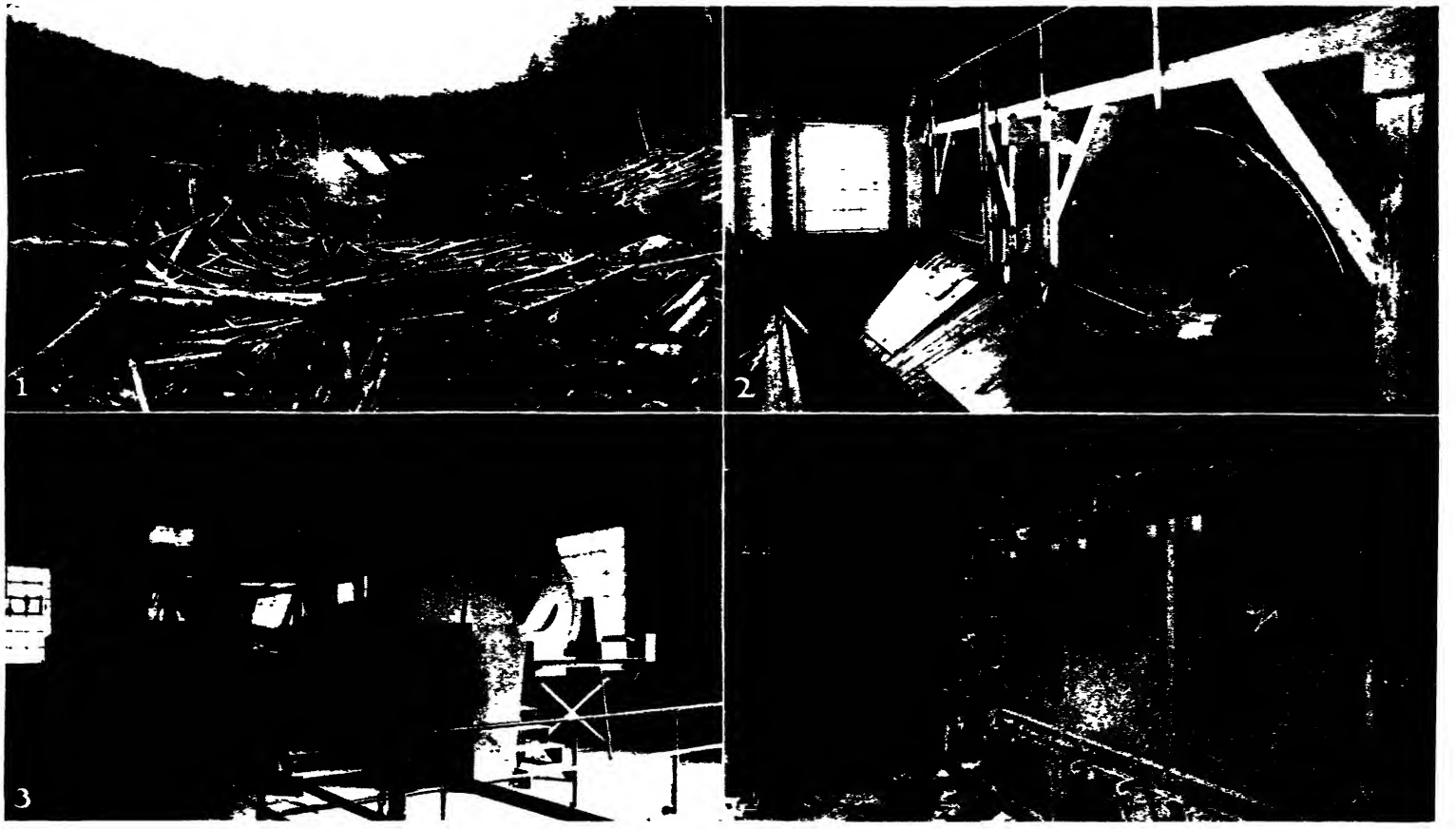
Manufacture. In the United States and Canada, wood fiber is more plentiful than all other vegetable fibers. The chief raw materials from which paper is made are spruce, hemlock, poplar and pine woods, rags, straw, and old paper; but three-fourths of the entire output is now manufactured from wood pulp. Poplar is considered the best wood for pulp. The value of rag paper is a little higher than that of paper made from wood, but it amounts only to about five per cent of the gross tonnage. Cotton and linen rags were the first material of which paper was made, the process then being almost exclusively a handicraft. The rags were cleaned, soaked, reduced to a pulp by beating and grinding, and floated on water that was kept in motion to distribute the fibers evenly. This is an important step.

When the natural structure of fibrous substance is broken down, the filaments mat easily. The surface of the water is thus coated with a thin film or tissue of cellulose, which may be described as the skeleton of plants. In the earlier process, this film was dipped from the water in shallow boxes, fitted with a wire mesh bottom, through which the water was allowed to drain. Such boxes were called *deckles*. The sheets of forming paper were turned out on beds of woolen felt. Layers of paper and felt were placed one above another, and the whole was placed in a press where the remaining water was squeezed out. The sheets were then hung up to dry, finished by sizing with glue or gelatin, and rendered smooth by pressure. Machinery has now been substituted for hand labor.

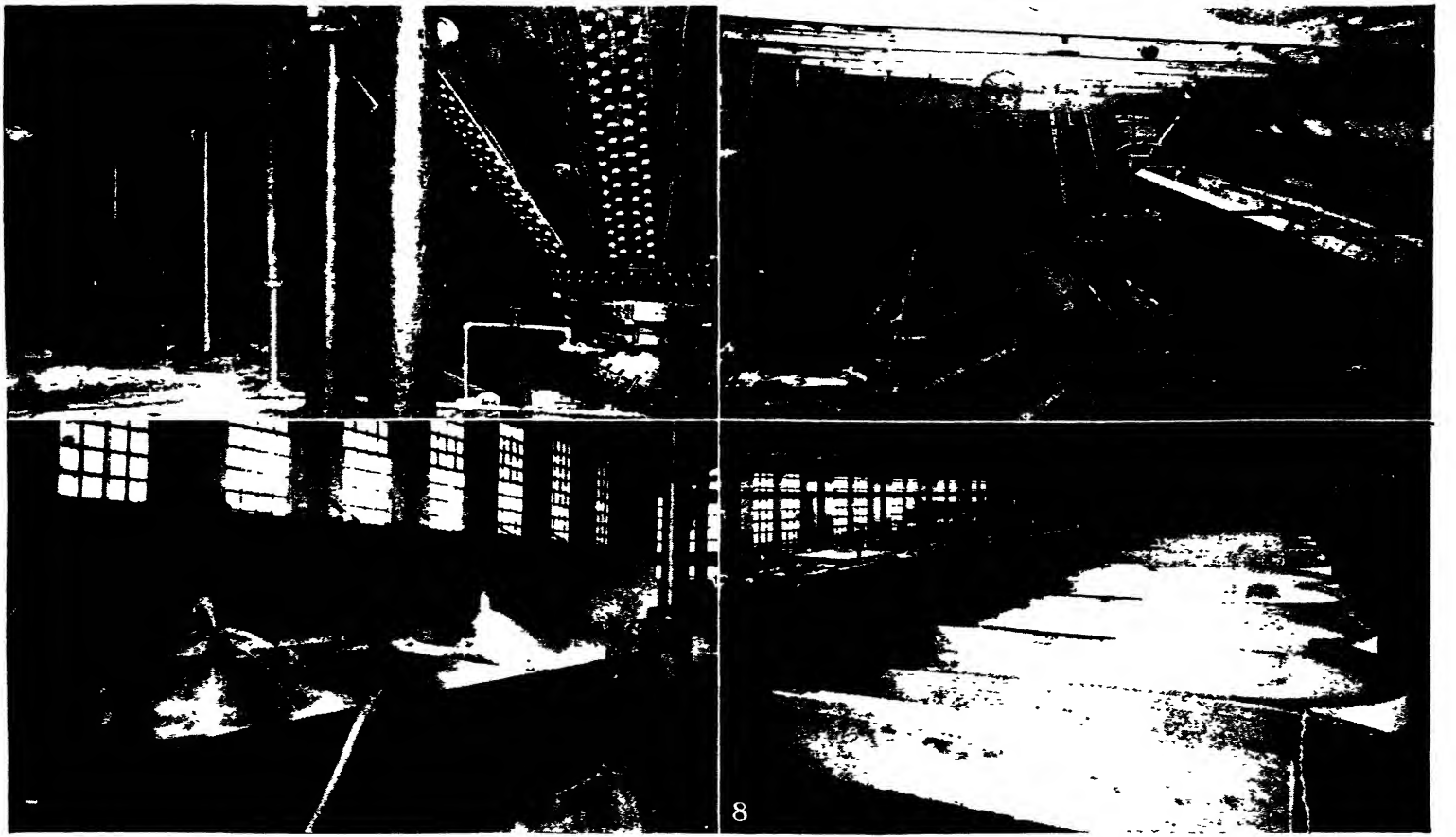
Whatever the fiber used the process described above is essentially that used in making paper. When wood is substituted for rags, the first steps of the process consist in cutting logs to lengths of from twenty-four to thirty inches and removing the bark. In the commonest process, the wood is then forced by water pressure against a revolving wheel with teeth and knives, in such a way that the fibers are torn from it obliquely. The pulp is strained and passed on to the beating engine, where it is further macerated with revolving knives. At this stage, color and sizing are added, in addition to a certain quantity of chemical, or "sulphite," pulp, and a percentage of clay to act as filling matter and give a smoother surface. The sulphite pulp is produced by treating the wood with a solution of sulphurous acid. A process of cooking in vats then reduces the pulp to an approximately pure cellulose fiber. If the wood is not treated with acids, the resulting paper is of inferior grade. In the so-called soda process, caustic soda is substituted for bisulphite in the cooking vats. Paper so made is dark in color and less durable than that made with sulphite.

The pulp, once refined, bleached, and colored, is ready for the paper-making machine. At the present time, the Fourdrinier machine, a delicately adjusted and most complicated piece of mechanism, is almost exclusively in use. It consists of three essential parts: the "wet" part, the "drying" part, and the finishing rolls, usually known as the calender rolls. The wet stock is allowed to flow through a wide aperture upon an endless wire screen with from

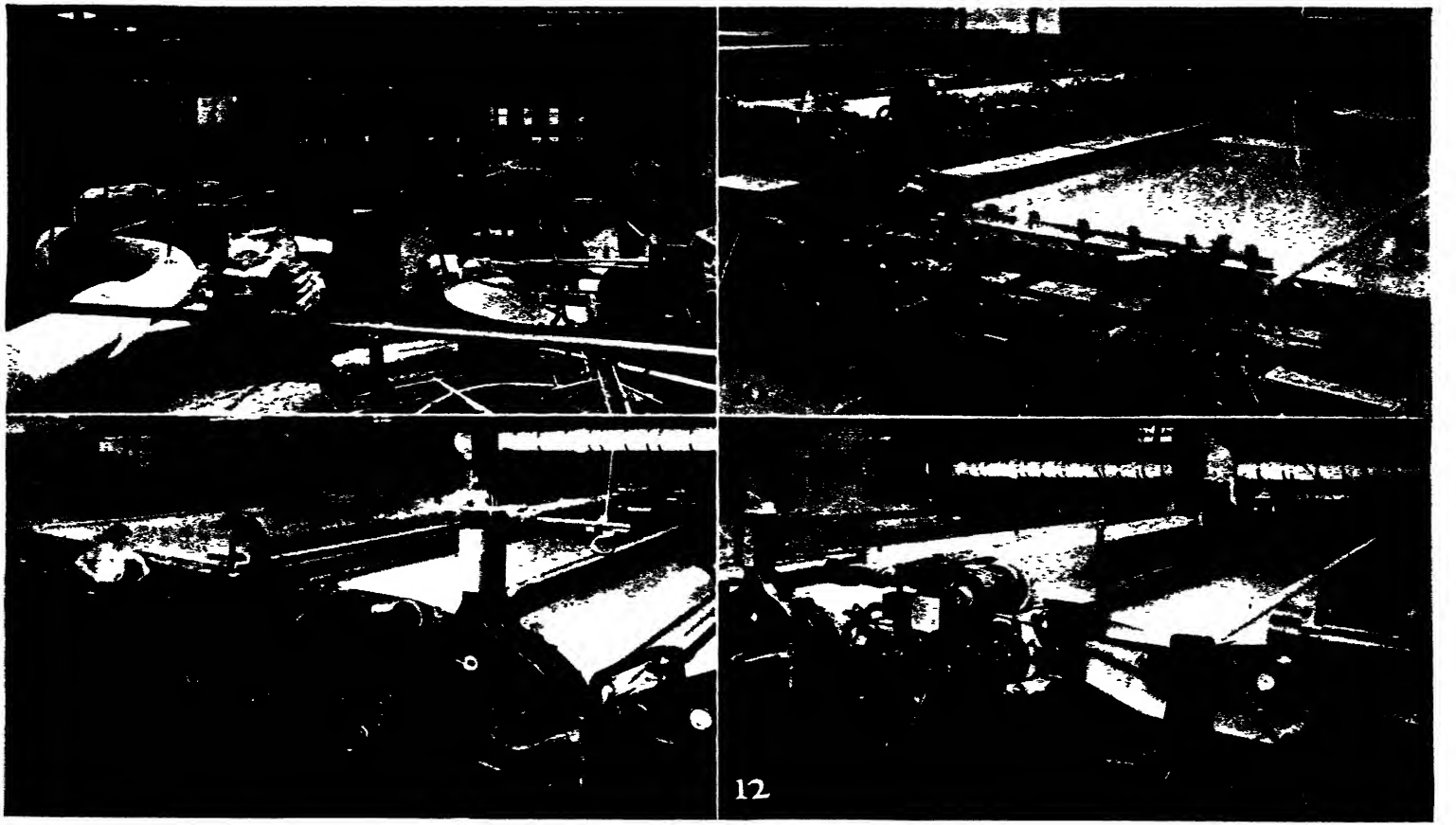
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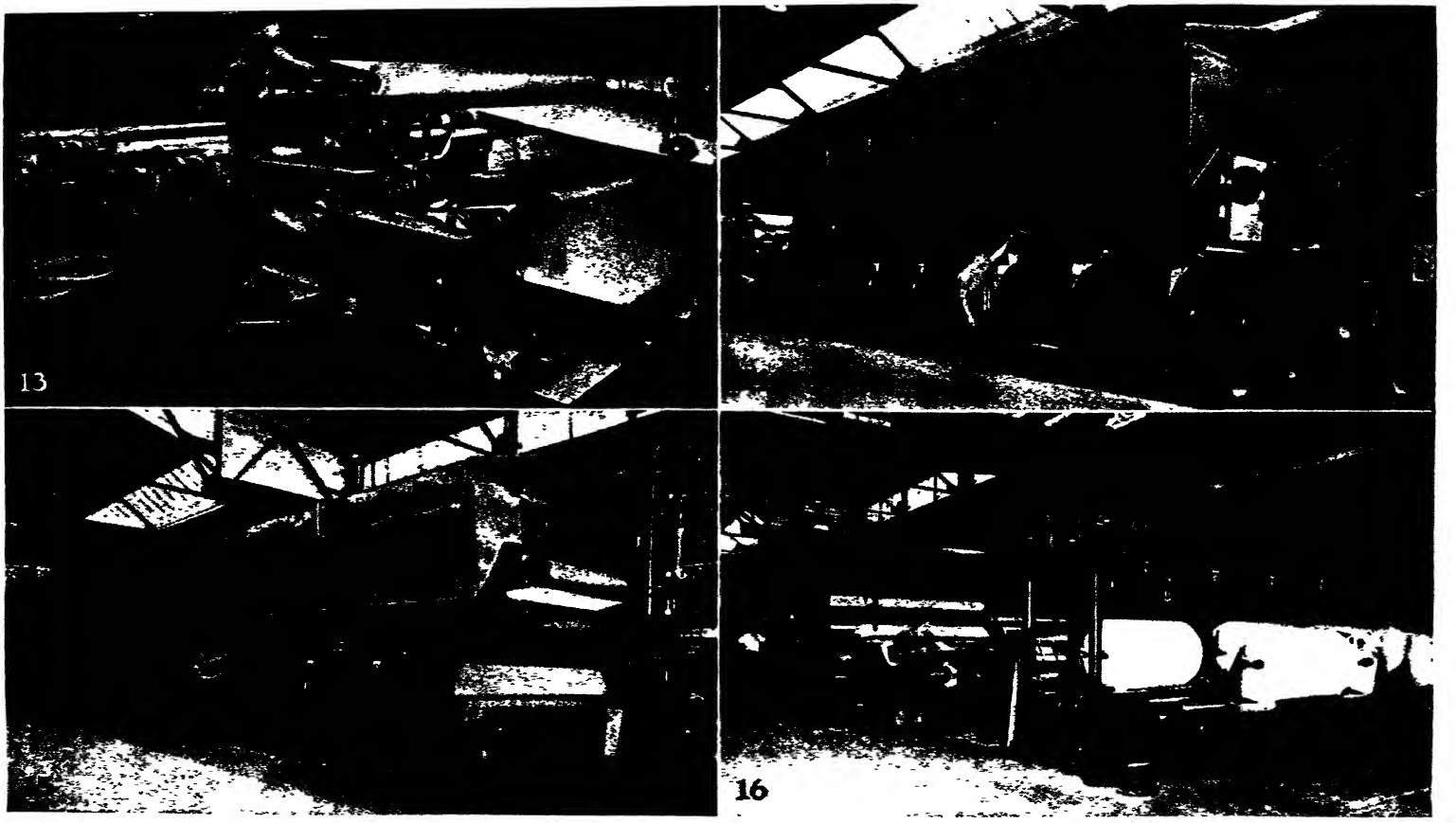
How Paper Is Made. (I) (1) The raw material from which wood-pulp paper is made. (2) A barker, which removes bark and dirt, and washes the logs before chipping. (3) A chip-house, where logs are cut into chips. (4) Here the bleaching and cooking liquids are made which are to reduce the chips to pulp.



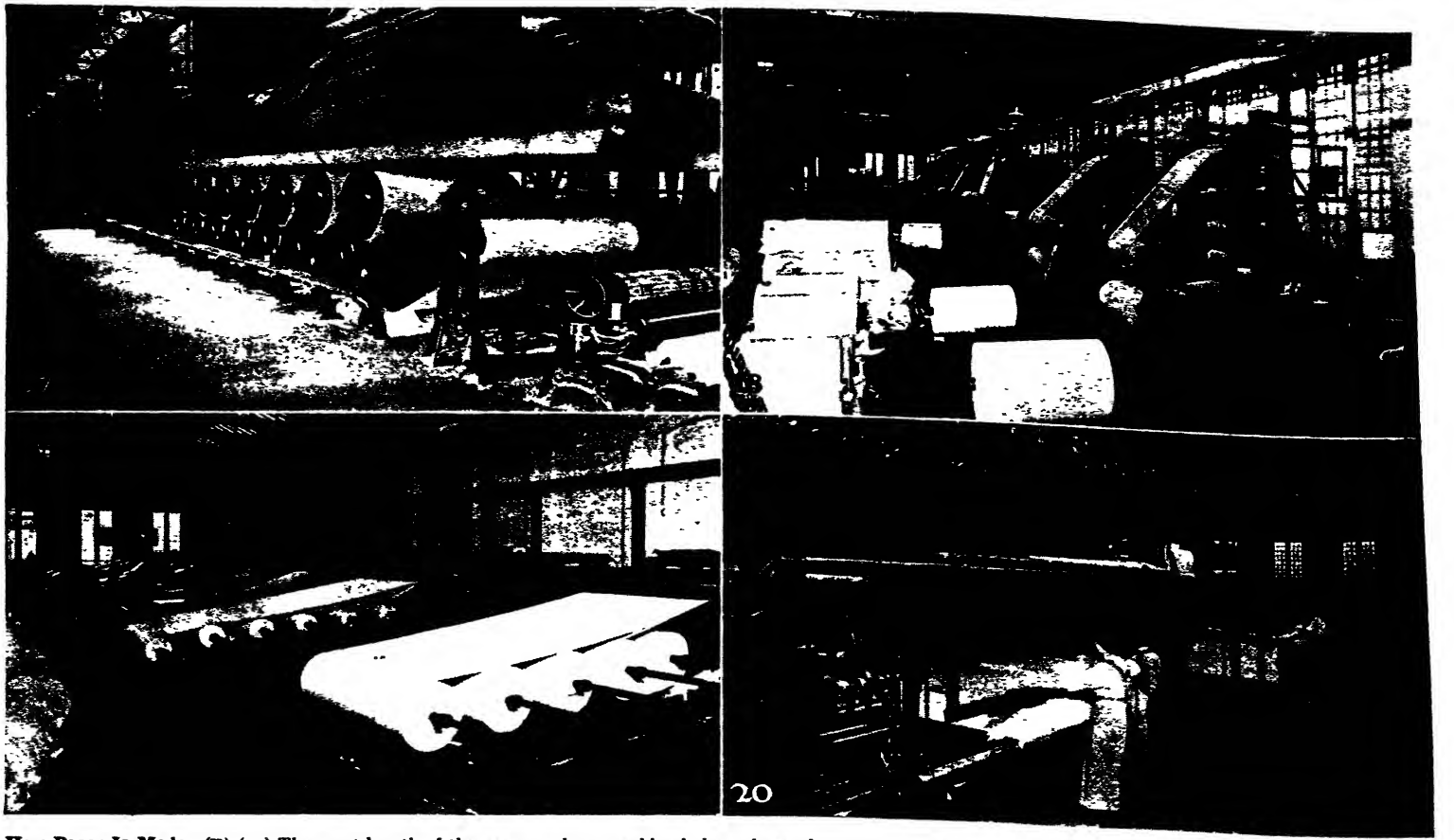
How Paper Is Made. (II) (5) The digester, where the chips are cooked to pulp. (6) The first step in washing pulp immediately after cooking. (7) A second step in washing the pulp. (8) Final step in bleaching pulp from the natural color of wood to white.



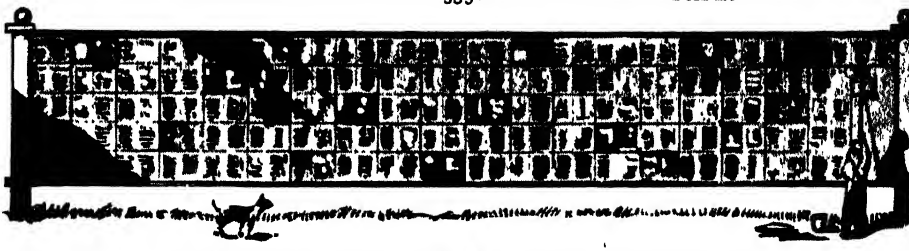
How Paper Is Made. (III) (9) Where pulp is reduced to a finer consistency, making it ready for the machines which make the paper. (10) Feeding pulp upon the wire of the Fourdrinier machine. (11) Removing most of the water from the pulp and starting the formation of a great sheet of paper. (12) The sheet has formed and is ready for the dryer



How Paper Is Made. (IV) (13) Running the continuous sheet from the wet end of the machine to the dryer. (14) First section of dryer; the second is identical. (15) Final section of dryer; paper is seen emerging. (16) The last section of the machine, where paper is given its surface finish and sometimes slit into smaller rolls.



How Paper Is Made. (V) (17) The great length of the paper-making machine is here shown, but parts at the farther end are not visible. (18) Where paper is given a very high finish, for halftone printing. (19) Where rolls are slit and cut to required sheet size. (20) The opposite end of the slitter and cutter shown in illustration 19.



THE PAPER USED IN ONE COPY OF A METROPOLITAN SUNDAY NEWSPAPER
If the pages of one copy of an average Sunday newspaper published in a great city were pasted on a billboard, a surface ten feet high and sixty feet long would be required

sixty to ninety meshes to the inch, which moves forward continuously. The speed at which it moves determines the thickness of the resulting paper. The width of the paper is determined by the distance between the "deckles," or rubber bands, placed at either edge of the screen. By the time the film of pulp has passed the length of the screen, it has lost enough water and is felted, or twined together, sufficiently to be transferred from the wire, over movable belts of felt, to the pressing machine, which consists of heavy rollers adjusted in pairs. Having passed through the pressing machine, the thin tissue of paper is conveyed on endless belts through a number of iron cylinders, arranged in horizontal tiers, and heated by steam. These are the "dryers." The final process of polishing and smoothing is accomplished by running the paper between the calender rolls. It is delivered to city newspapers and magazines in massive reels weighing about 500 pounds each. For other purposes, it is cut into sheets and packed 500 in a package.

Classification. Paper is used for three purposes, namely, writing, printing, and miscellaneous industrial use. Under the latter head, its chief uses are for wrapping, making paper boxes, etc. Linen paper is favored for writing and for documents which have to be preserved for long periods of time. So-called linen papers contain, for the most part, a proportion of linen, combined with some wood pulp. Most newspapers, magazines, and books are manufactured entirely of wood-pulp paper, the quality being usually slightly better in the case of bound volumes. Manila paper is made from jute, hemp, and other stout fibers, and there is on the market a so-called manila manufactured from wood. The variety known as "boards" is used largely in bookbinding. Straw paper is used for wrapping and other rough purposes. The so-called watermark, by which most superior grades of paper are distinguished, is impressed on the web while it is passing over the rollers. It can be seen by holding the papers between the eyes and the light, but is usually stamped only on letter paper and specially made book paper.

Paraffin (or "waxed") paper is made by running ordinary paper through a tank of melted paraffin, and then pressing the paper between cold steel rollers. Vegetable parchment is made by running the paper through a solution of sulphuric acid and other ingredients, then washing, drying, and finishing as in other papers. Both these varieties are waterproof, and the waxed paper is extensively used in wrapping butter, bread, and other food products.

Forest Destruction. Enough paper is made and used in some form every year in the United States to provide 165 pounds for every person, a total of about 9,000,000 tons. Mature trees on many hundreds of thousands of acres are felled yearly to supply wood pulp; paper-making is taking incredible tolls of the forest, in addition to timber requirements in other industries (see LUMBER). Over three-fifths of the wood pulp now going into the manufacture of paper for newspapers and magazines in the United States is imported from Canada; in all the states of the Union, the forest supply is being exhausted four times as fast as trees can be grown. Canada is becoming restive over the rapid destruction of its forests for paper-making to benefit a foreign country, and there are possibilities of a future embargo on exports of wood pulp from the Dominion.

Conservation. To lessen the drain on forest areas, scientists have worked for years to utilize waste and turn by-products into paper. Old newspapers have long been returned to the mills to be rendered again into new paper, but, until recently, the ink on them could not be removed successfully. In 1926, however, a new chemical process was discovered for making clean, fresh pulp from old newspapers and magazines. By this process, pigments, oils, and greases of the printing ink are separated and removed from the pulp. The economic value of this discovery is almost beyond estimate; it will save many a forest from conversion into wood pulp.

Cornstalk Paper. Another factor in the conservation of wood pulp is the recent successful manufacture of paper from cornstalks. Both newsprint and bond paper are now made of cornstalks, and even with the present limited production, the price is only two cents per pound higher than for ordinary paper. Thus far it has been found necessary to mix a certain



Photo U & U

MAKING NEW PAPER OUT OF OLD

Millions of copies of newspapers that are printed every year are unsold, and are returned to the office of publication A method has been developed by which the ink on them can be removed and the blank sheets can be reground into wood pulp and thus made again into news print. In the illustration, a workman is de-inking old newspapers.

proportion of wood pulp with the cornstalk pulp (approximately thirty per cent), but engineers predict that it will be possible to make paper exclusively from cornstalk pulp.

This discovery will be of immense value in utilizing waste products of the farm. At an average price of about $5 per acre for cornstalks, they become a valuable by-product. The outcome should improve the farmer's economic status and furnish a continuous supply of raw material for paper-making.

The process for making cornstalk paper was discovered by a Hungarian, Dr. Bela Dorner, head of the laboratories of the Royal Hungarian Railways. He brought the process to the United States, where further experiments have demonstrated its commercial practicability. In December, 1928, the *Commercial News* of Danville, Ill., and the *Prairie Farmer*, published in Chicago, issued editions printed entirely on cornstalk paper. In the same month, the first book printed on this material was published in New York. (For illustration, see CORN.)

The large available supply of cornstalks is more than sufficient to meet the nation's paper needs. The present development of this industry in the Middle West points to this section as the possible future center of the paper manufacturing industry.

Related Subjects. The reader is referred to the following articles in these volumes

Books and Bookbinding	Parchment
Newspaper	Printing
Papyrus	Vellum

PAPER BIRCH. See BIRCH.

PAPER BLOCKADE. See BLOCKADE.

PAPER NAUTILUS. See ARGONAUT.

PAPER SAILOR. See ARGONAUT.

PAPIER-MÂCHÉ, *pa pya' mah sha'*, translated from the French as "pulped paper," is the name of a substance made of paper pulp, mixed with oil, glue, paste, resin, or some other sizing, to make it hold together when dry. Copperas, quicklime, or white of egg is added when it is desired to make the substance resist water, and the addition of borax and phosphate of soda renders it fireproof. Papier-mâché was probably first manufactured in India, China, and Japan. Its manufacture in the United States is of recent origin, but it has become an important industry.

For some purposes, papier-mâché is made by gluing together sheets of paper and pressing the damp sheets into a mold. For other purposes, sheets of cardboard or box board are



Photo OROC

HANGING PAPRIKA IN THE SUN TO DRY
The scene was photographed in Hungary.

similarly treated, but the ordinary grade is made from scrap, waste paper, or wood pulp, to which quantities of ground chalk, clay, and sand are added.

There are many uses for papier-mâché. It is molded into masks, dolls' heads and other toys, trays, bowls, relief maps, artists' models, anatomical models, picture frames, buttons, boxes, tubes, pails, and numerous other articles of common use. One of its most important uses is as a mold for stereotype plates in the printing industry. It is sometimes used in place of stucco for ornamenting the interior of buildings. Papier-mâché is a desirable material for manufacturing purposes because it is comparatively inexpensive, light, strong, and durable, and can easily be molded into any desired shape and painted or decorated at will.

PAPILIONACEAE, *pah pil ih o na' se e.* See LEGUMINOUS PLANTS.

PAPILIONIDAE, *pah pil e on' e de.* See BUTTERFLY (Classification).

PAPILLA, *pah pil' ah.* See HAIR; SKIN; TONGUE.

PAPINEAU, *pah pe no',* LOUIS JOSEPH. See CANADIAN LITERATURE (French Canada: Patriotism and Histories).

PAPOOSE, a North American Indian baby. See illustration, page 3411.

PAPRIKA, *pah' pre kah,* a favorite Hungarian condiment, prepared from the pods of cultivated capsicum (which see). After the seeds have been removed, the pods are dried and powdered. Paprika has a bright-red color, but is less pungent than red or cayenne pepper, and has a sweeter taste. It is used for seasoning edibles, especially dishes prepared from a combination of meats and vegetables, as goulashes, stews, etc., and is also employed in salad dressings. It has come into very common use in North America. B.M.D.

PAPUA, *pah' poo ah,* an old name for the island of New Guinea (which see).

PAPYRUS, *pa pi' rus,* an Egyptian water plant that has enabled man to preserve from oblivion the records of dynasties long since passed into history. The reedlike plant was used by the ancients for a variety of practical purposes in addition to the most important one, the manufacture of the crude but long-enduring papyrus rolls which modern research has brought to light. It served also as a material for mats, sandals, and sailcloth for light skiffs. Even the brownish flowers were utilized to form garlands to adorn the shrines of the Egyptian gods. The little ark in which the mother of Moses concealed her son is believed to have been made of papyrus. Some

authorities, however, believe that several different species fulfilled these various uses, all called by one name.

The papyrus, or paper, of the Egyptians was made of strips of the pith arranged in layers.



TWO FORMS OF THE PAPYRUS PLANT

It appears in the earliest monuments in the shape of long, rectangular sheets. The writer used a reed called *kash*, with red or black ink whose formula is unknown to-day. The sheets were at first rolled and tied with a string, later they were bound together like the modern books. These rolls and sheets varied in dimensions; in many instances, they reached a length of 144 feet. When newly prepared, the papyrus was white, but time has turned those which have come down to us a light or dark brown, and age has made them very brittle.

For a long time, the city of Alexandria jealously guarded the monopoly of preparing the paper, and the refusal of the Egyptians to supply it to Europe was one of the causes which led to the employment of substitutes. After the twelfth century, papyrus was superseded by parchment and by paper made of rags.

The plant is nearly extinct in Lower Egypt, but still grows in the valley of the Upper Nile. It has large, straight stems, which grow from three to ten feet in height. These bear no foliage whatever, and the coarse, sharp-edged leaves spring directly from the rootstock. The flowers are lacking in both sepals and petals, but are surrounded by bristles. The cultivation of papyrus for paper has been resumed on a small scale in the Nile delta. A plantation near Alexandria has been sown, and the harvest transmitted to an English paper mill, where it is manufactured by modern machinery into a paper of good quality. The papyrus fiber is also used in the manufacture of rope, sailcloth, sandals, coarse garments, and mats B.M.D.

Scientific Name. The papyrus belongs to the sedge family, *Cyperaceae*. Its botanical name is *Cyperus papyrus*

PARA, *pah rah'*, a standard coin of Turkey. See MONEY (Foreign Monetary Standards).

PARA, BRAZIL. See BRAZIL (The Cities).

PARABLE, a short story which uses incidents and facts of everyday life to illustrate a moral or spiritual truth. It is a form of allegory (which see). Greek and Latin writers make wide use of the parable, but the finest examples of this form of literature are found in the Bible

One of the best-known Old Testament parables, told by Nathan to David, is that of the poor man's one ewe lamb, which the rich man seized and killed when a traveler called at his door for food When David became angry at the rich man's cruelty, Nathan turned upon him with the words, "Thou art the man" (*II Samuel* XII, 1-7).

Jesus made use of many parables in His teachings. The parable of *The Good Samaritan* (*Luke* X, 30-37), the story of a wayfarer who helped a stranger that had fallen among thieves, illustrates the spirit of neighborliness

There are several parables in *Matthew* XIII which illustrate the growth of the Kingdom of God among men; these include the parables of the mustard seed which grew into a great tree, of the leaven that made light the whole loaf, of the wheat and the tares that grew together until the harvest, and of the sower who sowed seed in the different kinds of soil

Three parables in *Luke* XV picture the joy felt in heaven over a wanderer's return to the Kingdom; these are the parables of *The Lost Sheep*, *The Lost Coin*, and *The Prodigal Son*.

The parable of *The Ten Virgins* (*Matthew* XXV, 1-12) illustrates two classes of people who desire citizenship in the Kingdom. Five met the conditions and were admitted, but five failed and found that the door was shut.

The New Testament parables have inspired many beautiful hymns. See illustration on the following page.

PARABOLA, *pa rab' o lah*. If you are playing baseball and hit a high "fly," the ball rises at first rapidly, then more slowly, then curves more and more toward the earth, until at last it is coming almost directly downward. But for the effects of friction with the air, the curve which the ball follows in descending would be exactly the opposite of that by which it ascended, and the whole curve, from the time the

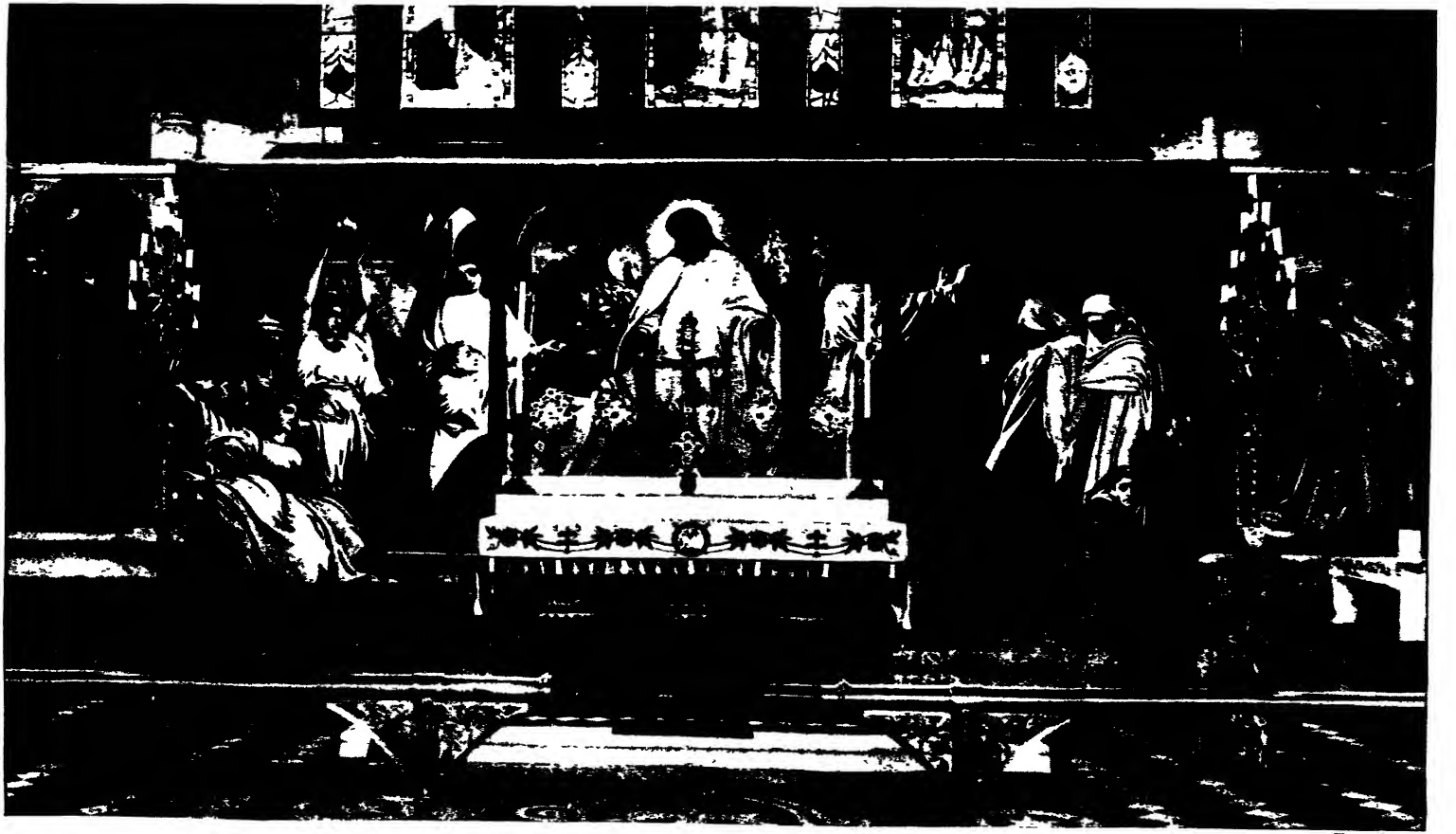
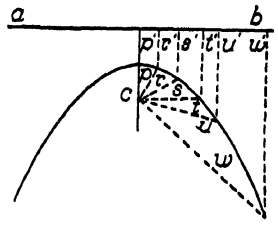


Photo: O R O C

Parable of the Ten Virgins. A reproduction of the painting by Leighton. It is now in Lyndhurst Church (Saint Michael's), Lyndhurst, Hampshire, England. The reader is referred to *Matthew* XXV, 1-12. (See PARABLE, page 5354)

ball is hit till it is caught, would be a *parabola.* Exactly described, a parabola is a curve in which every point is equally distant from a certain fixed point and a certain fixed straight line In the case of the ball, the point would be somewhere directly under the highest point reached, and the line would be a horizontal one above this highest point Another definition of a parabola describes it as the section of a *right circular* cone made by a plane parallel to a line on the slanting surface of the cone See illustration above.



A PARABOLA

Any point in the curve is as far from the line *a b* as it is from the point *c* Thus, *p* equals *p'*, *r* equals *r'*, etc

The parabola is usually studied nowadays in analytic geometry, but it was studied by ordinary methods by the ancient Greeks, notably by Apollonius, in the third century B C. (see GEOMETRY) J W Y.

PARACELSUS, *pair a sel' sus* (about 1490-1541), a German physician who is remembered chiefly for the new impetus he gave to medical investigation He was born in Switzerland, and in his boyhood was educated for the profession of medicine by his father, himself a physician and chemist Paracelsus later attended the University of Basel for a brief period, and then, after studying chemistry and al- From 1526 to 1528, he lectured at the University of Basel, but was dismissed because of his denunciation of existing methods in medical practice, his scorn of all accepted traditions, and his dissolute personal habits Thereafter he lived a wandering life, meeting opposition to his theories wherever he went. Several stories are told to account for his death at Salzburg, in 1541. One commonly heard is that he was thrown from a window by the servants of a physician who hated him, and that his neck was broken.

While Paracelsus is credited with no single important medical discovery, he deserves honor as an original investigator. He showed the fallacy of the accepted belief that people were made sick by too much or too little bile or blood, and he laid the foundation for the later method of curing diseases by specific remedies Pharmacy and chemistry are both indebted to him, and he introduced into medical practice, among other remedies, sulphur, iron, arsenic, opium, and mercury See ALCHEMY



Photo U & U

A PARACHUTE FOR AN AIRPLANE

From a height of 7,000 feet, an aviator in California unloosed a parachute attached to the airplane, the craft floated slowly to the ground, with no other damage than flattening the wheels and splintering the propeller [For another illustration of a parachute, see the article AIRCRAFT, *page 137]*

PARACHUTE, *pair' a shoot,* an invention in the form of a large umbrella, used to break the fall of a person from aircraft, or from any great height. The principle embodied was well understood in early times. After balloons were invented, parachutes were used as a means of descent from them Some years ago, balloon ascensions and descent by means of a parachute were common features at county fairs The parachute was attached by means of a rope to the basket below, and remained closed when the balloon

chine so as to break the fall in case of accidents. After the World War, experiments were made to develop an efficient parachute for airplane use. In 1923 the seat-pack type was invented, and by 1924 it was accepted as a part of the standard flying equipment. The pack, which is about the size of an ordinary chair cushion and twice as thick, is strapped to the aviator's back so that it forms a rear cushion when sitting in the plane Two or three seconds after the aviator leaps from the airplane, he pulls the "rip cord" and thus releases the pack As it spreads out (about twenty-four feet in diameter), the wearer is carried in swing-like straps to the ground.

[The word *parachute* is of French derivation, and means *to guard against a fall*]

PARACLETE. See ABELARD.

PARA-DICHLOROBENZENE, *pah' rah-dih klo ro ben' zene* See INSECTIDES AND FUNGICIDES

PARADISE, a word from the Persian, borrowed by the Greeks, and originally used to denote the pleasure grounds of Persian kings. Translators of the Old Testament applied it to the Garden of Eden, but the early Christians used the name in connection with the future dwelling place of the blessed dead. It is now used as a name for Heaven, and was so employed by Jesus when He spoke to the dying thief upon the cross See HEAVEN

PARADISE LOST, the name given by John Milton to his great epic in which he describes the fall of man It was published in 1667. One critic calls it "perhaps the loftiest monument of human genius," and all agree that it ranks with the greatest poems the world has ever known—with the *Iliad*, the *Divine Comedy*, and *Faust* Milton, who wrote the poem after he had become blind, had had the production of some such work in mind for many years, and had considered many subjects, among them the Arthurian legend, but he chose the Biblical narrative as the only theme lofty enough For sustained majesty, no other poem equals it See MILTON, JOHN, EPIC

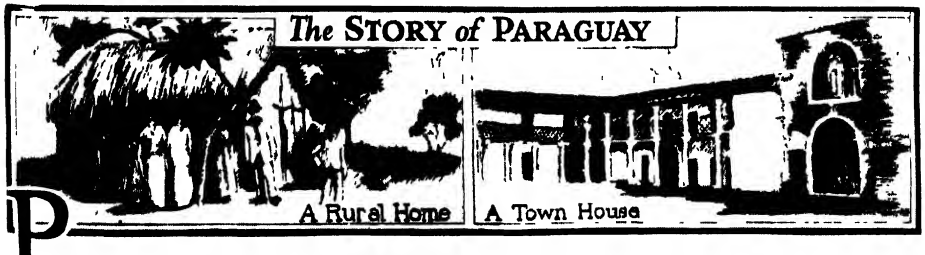
PARADISE VALLEY. See RAINIER, MOUNT

PARAFFIN, *pair' a fin*, a hard, white, tasteless, and odorless substance that resembles wax, and is used to a great extent in making candles For this purpose it is mixed with small quantities of stearin (which see) Among other uses, it is employed in the manufacture of matches and of wax paper, is used to give weight and luster to calicoes and other fabrics, and to extract oils from plants and flowers, and is a frequent adulterant in chewing gum Although paraffin occurs in nature in the mineral ozocerite, the greater part of the commercial product is obtained by distillation from petroleum In Germany, it is prepared by distillation of various kinds of brown coal, and in Scotland, an important center of the paraffin industry, it is manufactured from Boghead coal and bituminous shales

Paraffin oil, benzine, and asphalt are important by-products obtained in the manufacture of paraffin; and oil gas, which is obtained from paraffin oil, is used to a considerable extent in illuminating ships and railroad cars and to improve the quality of coal gas The commercial importance of paraffin dates from 1851, when the Scottish chemist, James Young, perfected a practical method of manufacture In recent years paraffin has become a household necessity for the sealing of jellies and jams

In chemistry, *paraffin* is a general term for a group of hydrocarbons (which see)

PARAGRAPHIA, *pair ah graf' ih ah*, a form of aphasia (which see)



PARAGUAY, *pair' a gwa*, or *pah rah gwi'*, a small South American republic enclosed by Brazil, Argentina, and Bolivia, and thus shut off from the ocean With a history reaching back through nearly four centuries, it seems now to be, economically, just at the beginning of its career, and gives promise of great progress.

The People. That a people so long Christianized, in many respects differing so little from their progressive neighbors and requiring much the same imports, should possess a land so new in development is to be explained only by their unparalleled history The body of the rural population is of the aboriginal, or "Indian," race, known as *Guaraní* They have been brave, sincere, and passionately devoted to their native land. In the rural districts, their dress is of the simplest character The women wear a mere tunic of cotton cloth, and a *manta* of the same material—a scarf

arranged to form both a sort of Oriental headdress and a wrapping for the shoulders. The men go barefoot, and their dress consists of a shirt and trousers. In their simple life, they practice the primitive Christian virtues. The people of the cities and villages are generally of mixed Spanish and Indian blood. There are approximately 30,000 inhabitants of foreign birth, chiefly Italians and Argentines. In 1893 a colony of Australians founded a small experimental settlement on an optimistic and sociological basis, and named it New Australia. It still exists. An official estimate in 1926 gave the country a total population of 853,221.



LOCATION MAP

One of the two South American countries without a seacoast The map shows the size of Paraguay compared to the entire continent

About 30,000 uncivilized Indians live in their primitive way in the partially unexplored regions of the Chaco. In the cities there is an earnest desire for all the benefits of modern progress; and despite the poverty in which the country was left in 1870, the people are making earnest efforts to develop their resources and are inviting immigration to their land of great opportunities. The more recent architecture is strikingly modern in style, and is highly suggestive of the spirit of progress.

The Cities. There are about 130 towns and villages in the country, the names of many of them indicating the piety of their founders. Villa Rica, with a population of 26,000 (1926); Luque, 13,000; Encarnacion, 12,500; Carapequa, 12,000; Concepcion, 11,000; and Paraquari, 10,000, are the only towns outside of the capital which have a population of 10,000 or more.

Asunción, *ah soon' se ohn,* officially known as the city of NUESTRA SEÑORA DE LA ASUNCIÓN, is the capital and chief port of Paraguay, and is situated on a superb harbor of the broad and deep Paraguay River. The city is 970 miles, by river, almost due north of Buenos Aires.

Asunción was for more than a century the capital of all Spanish territory in Eastern South America. The original purpose of the Spanish in establishing a city so far from the coast was to create a southern outlet for the gold and silver and the commerce of Peru, which then included Bolivia

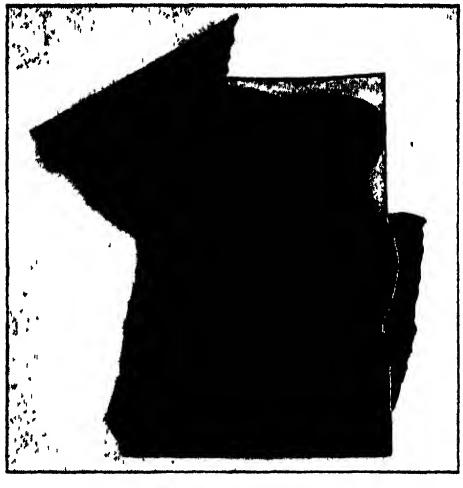
The work of the early missionaries centering here can be compared only with that of Saint Patrick in Ireland, eleven centuries earlier, in the magnitude and quickness of its results and in its peaceful character. But the struggle of the Spanish government with the Jesuits led to deplorable results, undoing much of the missionary work; and the long tyranny of Francia and his nephew and grand-nephew retarded both the city and country.

Asunción remains, however, the chief center of trade for Paraguay A line of river steamers connects the city with the outside world, and since 1913 it has had railway connection with Buenos Aires.

The city had a population of about 114,000 in 1926. It is laid out in regular squares The principal streets have street cars, electric lights, and good paving There is telephone service, and automobiles are much in use Touring cars and motor trucks take the place of railways over the level country to points not yet reached in railway construction. Motor boats by dozens run on the river Although the climate is hot, it is very healthful.

Asunción contains numerous churches, a cathedral (the bishopric dating from 1547), a national college, a public library, and the palace begun by the later Lopez; but its modern development did not begin until about 1880, and its more notable buildings are so strikingly new as to remind the visitor of the young cities of North America Examples of these are the courthouse, the national college, the agricultural bank, and the municipal building

Physical Features. The upper Paraguay River separates the country into two principal divisions. That between the Paraguay and Paraná rivers, known as Paraguay proper, covers an area of about 70,000 square miles.



COMPARATIVE AREAS

Washington and Oregon together are nearly as large as Paraguay The province of Alberta is about 80,000 square miles larger.

West of the upper Paraguay lies a vast plain, known as the Chaco, of some 100,000 square miles of extensive pasture lands and valuable forests, largely unexplored. The title to this region is disputed by Bolivia.

A range of highlands, rarely exceeding 1,600 feet above the sea level, runs north and

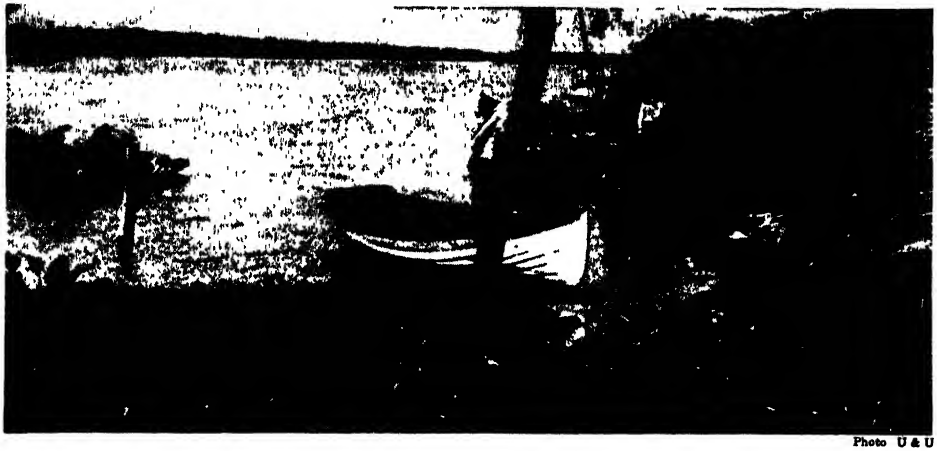


Photo U & U

HERE BOLIVIA SEEKS AN OUTLET TO THE SEA

Scene on the Paraguay River Bolivia is the only country of South America which is deprived of water connection with the ocean. Paraguay and Bolivia have clashed over the latter's demand for waterway rights

south through much of what is called Paraguay proper, east of the Paraguay River; this high rolling country is covered with rich pastures and fertile fruit groves. To the south the land becomes marshy, and is clothed with dense evergreen forests. The Pilcomayo River, which flows down from the northwest through a region of low, wet, wooded, or grassy plains, is navigable in both its upper and lower courses, but shallow in its middle course. The Paraná River, which forms the southeastern boundary of the country, has a succession of noble cataracts, and for a hundred miles is a continuous chain of rapids; the islands of Yacireta and Yasyrenta in this river belong to Paraguay.

The climate is subtropical, hot for three months—December, January, and February—but springlike for the greater part of the year, and with a moderate rainfall is agreeable and healthful.

Products and Commerce. The soil of Paraguay is rich, and its immense possibilities as a food-producer are practically undeveloped. The forests and hillsides yield the famous *yerba maté*, or Paraguay tea, which is the chief article of export. *Yerba maté* is obtained from an evergreen shrub of aromatic character, the leaves and stems of which, when dried on hot plates, supply a powder that is dissolved in hot water, and furnish the favorite beverage of South America (see MATÉ). An aerated form of this beverage has been introduced in the United States.

Cotton-growing is a rapidly developing industry in Paraguay, and the ginned cotton exported in 1924 was more than four times greater than that exported in 1922. This expansion has been a great stimulus to the demand for agricultural implements The cultivation of sugar cane, especially for distillation purposes, promises great future expansion, and the production is on the increase again, after a decline which started in 1920. Though the methods employed are primitive, grains, rice, and tobacco grow abundantly under cultivation; and fruits, chiefly oranges, exported largely to Argentina and Uruguay, grow in great abundance, practically without cultivation The extraction of petit-grain oil from the leaves of the sour orange is a growing industry.

One of the most profitable branches of agriculture yet undertaken in Paraguay is the breeding of livestock. The government encourages the meat-packing and meat-curing industry, and these lines, together with the hides exported, constitute a prosperous business. During the World War, there was a great demand for meats, and many Paraguayan cattle were exported. A depression followed because of the poor quality of the meat, and since that time such attention has been given to better breeding that the quality of meat has greatly improved. In 1927 the number of cattle was estimated at over 5,000,000.

The forests of Chaco are noted for their *quebracho* timber, the most valuable source of tannin. Iron, manganese, copper, and other minerals are found in abundance. Ore deposits estimated at 60,000,000 tons are contained in the Quiquio and Ibicui manganese mines. Petroleum is also found in commercial quantities. There is little manufacturing outside of sugar and the meat industry, which includes packing and curing of meats and tanning of the hides. The chief exports are hides, yerba maté, oranges, tobacco, timber, canned and preserved beef, and cattle, and they go principally to Argentina, Uruguay,

Outline and Questions on Paraguay

I. Location and Size

(1) An inland country
(2) Boundaries

II. The Land

(1) Two principal divisions
(2) Highlands
(3) Rivers

III. The People

(1) Population
(2) Racial characteristics
(3) Dress
(4) Cities
(5) Education and religion

IV. Industries and Commerce

(1) Possibilities of the country
(2) Limited production
(3) Crops
  (a) Maté
(4) Stock-raising
(5) Manufactures

V. Government and History

(1) Centralized republican form of government
(2) Discovery and early settlement
(3) Christianization
  (a) Work of missionaries
(4) Expulsion of Jesuits, and lapse of people into barbarism
(5) Independence secured
(6) Dictator presidents
(7) Disastrous wars
(8) Modern progress and needs

Questions

What advantage has a coastward route along the Paraguay River over a route along the Amazon?

Describe the dress of the women and of the men in the rural regions. What are some of their moral characteristics?

How was the excellent work of the Jesuits undone?

What is the problem that presents itself when the original settlement of Paraguay is considered?

How do historians account for the choice of location?

What countries of South America have an area smaller than that of Paraguay? How many have a smaller population? How many states of the United States are larger?

When did Paraguay become independent? Why could it scarcely be called a republic during the first sixty years of its existence as a free country?

When did the country have almost four times as many women as men? What was the cause of this condition of affairs?

and the United States. The imports, chiefly from Argentina and the United States, are textiles, flour and wheat, machinery, hardware, groceries, and kerosene.

The navigable rivers for years have formed the principal means of transportation, supplemented by bullock carts for the overland transportation over wretched trails, for the country roads are mere cow paths. Paraguay has only about 525 miles of railway; hence transportation is as yet difficult and costly.

Education. Elementary instruction is free, and is in theory compulsory, but laws compelling attendance are not well enforced, and schools are not everywhere available. There are private schools and Church schools for the children of the well-to-do. There are about 1,300 public schools in the country maintained by the government, together with a few high schools, normal schools, and a university at Asunción.

Government. Paraguay is a centralized republic, the executive being a President chosen directly by the people. He is assisted by five Ministers. The legislature consists of a Congress of two houses—a Senate of twenty members, and a House of Representatives with forty members, all elected directly by the people. The Roman Catholic Church is supported by the State, but other religions are tolerated.

History. Paraguay had its beginnings with the founding of the city of Asunción, in 1535, by De Ayolas, Sebastian Cabot having erected a temporary stockade years before. De Ayolas soon perished at the hands of the natives, and Irala, a most capable man, was left to command the colony. After his death, in 1557, anarchy ensued, and the Spanish influence declined. Peru considered Paraguay as a province in the viceroyalty of Peru, but exercised only nominal control.

Missionary activities of the Jesuits, which extended from 1609 to 1768, dominated the history of Paraguay for that period. Their discipline was most thorough, and their range of authority wide. They tamed the wild savages and made them peaceful, industrious, and obedient. They dictated their marriages, assigned definite duties for each period of the day, and sounded church bells as a signal to start the next task. The Jesuits were expelled in 1769 by act of the king of Spain, and their work was undone to a very great extent, many of the people lapsing into barbarism. In 1776 Paraguay became a part of the viceroyalty of Buenos Aires.

Independence from Spain was secured in 1811. The Presidency of the new republic fell to Dr. Francia, who ruled with a rod of iron until 1840. He cut Paraguay off from all outside intercourse and raised in effect a sort of Chinese wall around the country, even

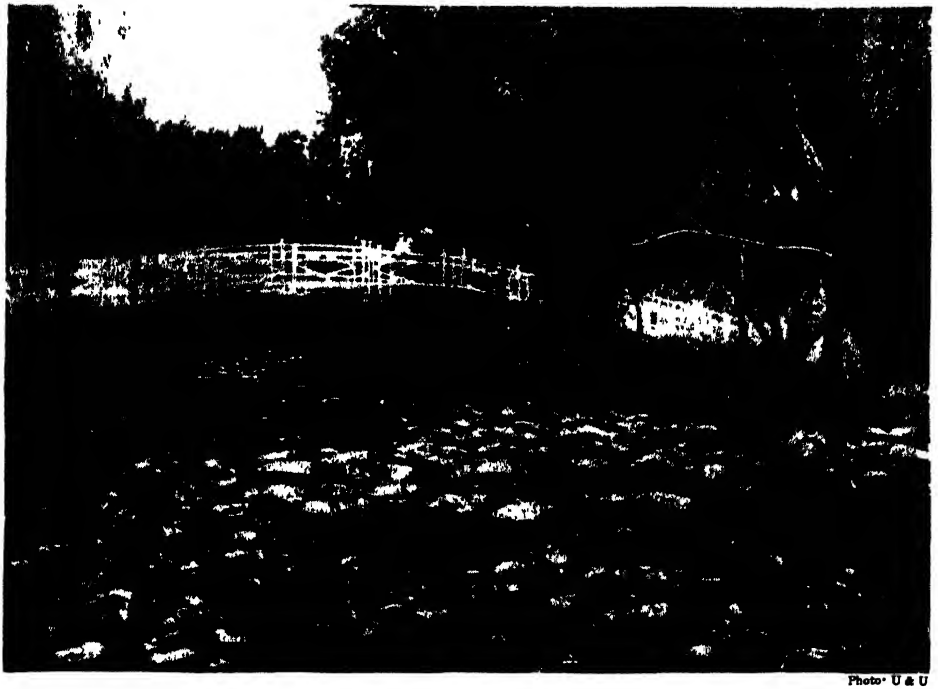


Photo: U & U

BOTANICAL GARDEN IN THE CAPITAL CITY

going so far as to close navigation on the Paraguay River. On his death in that year, his nephew, Antonio López, succeeded, and carried on a similar despotism until his death, in 1862, although he abandoned the idea of national isolation and adopted some liberal reforms. Then a third member of this family, F. Solano López, wrought the final tragedy of his people. This ambitious despot waged a disastrous war with Brazil, Argentina, and Uruguay for five years (1865-1870), impressing into service even the aged and infirm, and forming whole regiments of boys of twelve to fifteen years. In his final retreat he destroyed, so far as possible, all the property of his own people. This misguided ruler and his last remaining force of 470 men were slain in the swamps of Aquidaban in 1870, and peace came at last to a ruined land. It was practically a land without men. Out of a population exceeding the present number, five-sixths were lost, only about 200,000 remaining, mostly women and children.

A new Constitution was adopted in 1870, and after six years, the Brazilians withdrew their forces, but frequent civil wars have checked the progress of Paraguay. Inability to meet its debts has further embarrassed the country.

The establishment of railway communication with Buenos Aires in 1913, however, together with renewed diplomatic relations with the United States, has done much to lessen the isolation of the country. It is interesting that aviation is developing rapidly in this once so backward country. The government remained neutral during the World War, but adopted a resolution of sympathy with the Allies. The republic is a member of the League of Nations. W.W.S.

PARAGUAY, a river in South America, important commercially because it flows through the most productive temperate region of the continent. It is the largest tributary of the Paraná, which unites with the Uruguay to form the Plata (see RIO DE LA PLATA). Rising in the plateau of Western Brazil, the Paraguay flows in a general southerly direction for 1,500 miles. Its longest tributaries are the Pilcomayo and the Bermejo. Including the Plata and lower Paraná, it is part of a water system about 2,500 miles long, and is navigable to within nearly 300 miles of its source, where falls and rapids make boat travel impossible. Asunción, the capital of Paraguay, and a flourishing commercial port, is situated on its banks; large vessels ply between this city and Buenos Aires, the capital of Argentina.

PARAGUAY TEA. See MATÉ.

PARALLAX, *pair' a lax,* in astronomy, the difference in direction of a heavenly body as seen from two different points. Parallax is illustrated in a simple way in Fig. 1. The post *p* is directly in front of the house, but when

viewed from *a*, it is in line with the corner *a'*, and when viewed from *b*, it is in line with *b'*; that is, as the observer moves from *a* to *b*, the post seems to move from *a'* to *b'*. When viewed from *c*, the post appears in its true position in reference to the house. The angle *a p c* is the angle of parallax when the observer is at *a*, and the angle *b p c* is the angle of parallax from *b*. As the observer approaches *c*, this angle becomes smaller and smaller until, when he is standing at *c*, it disappears.

Fig. 2 illustrates the parallax of heavenly bodies within the solar system. For convenience in use, all observations of the position of the nearest heavenly bodies are referred to the center of the earth, *e*. The object *s*, could it be viewed from *e*, would appear in the sky as at *s'*, its desired position When viewed from *a*, it appears as *s''*; viewed from *b*, it appears at *s'''*. The angles of parallax are *a s e* and *b s e*. To find the distance of *s*, simultaneous observations of its position may be made at two widely separated places, as *a*

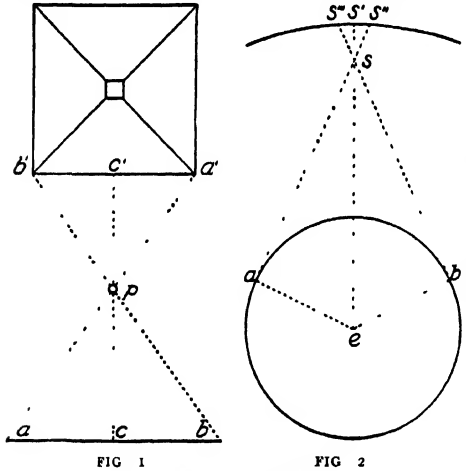


FIG 1 FIG 2

ILLUSTRATION OF PARALLAX

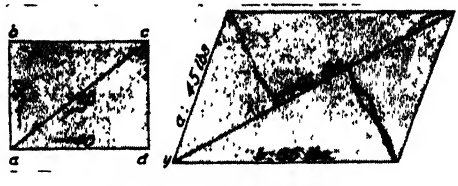
Explanation of figures appears in the accompanying text

and *b*. Using the results of these observations, and knowing that *a e* and *b e* are equal to the radius of the earth, one can determine by trigonometric computation the distance of the object from the earth.

In computing distances of fixed stars, the radius of the earth's orbit must be used as a base line. The angle which this distance subtends at the distance of the star is the parallax of the star. See diagram, in the article ASTRONOMY (Distances that Defy the Imagination). F.B.L.

PARALLELOGRAM, *pair a lel' o gram.* See QUADRILATERAL; MENSURATION.

PARALLELOGRAM OF FORCES, a mechanical principle discovered by Newton, stated as follows: "If two forces act on a point and if lines be drawn from that point representing the forces in magnitude and direction, and a parallelogram be constructed on these lines as sides, their resultant will be represented in magnitude and direction by that diagonal which passes through the point." Although the resolution of two forces acting at right angles is



PARALLELOGRAM OF FORCES

A force of 30 pounds acting at *a* toward *b* and a force of 40 pounds acting at *a* in the direction of *d* are equal to a single force of 50 pounds in the direction of *c* The same rule applies when the two forces do not act at right angles, as in the oblique figure In that diagram, *a* and *b* are two forces acting with a force of 45 and 65 pounds, respectively The resultant is a single force of 91 pounds This result is obtained by trigonometry

the most common, in which case the parallelogram is a rectangle, the principle holds equally for oblique forces. See COMPOSITION OF FORCES. A.L.F.

PARALYSIS, *pa ral' ih sis*, or loss of the power of voluntary movement, is in most cases the result of some disorder of the nervous system, as muscular movements are produced by the stimulation of certain nerve cells The seat of disorder may be the brain or the spinal cord Many cases of paralysis are due to the brain disease known as apoplexy, a full discussion of which is given in these volumes under the heading APOPLEXY. Inasmuch as the motor areas (those controlling movement) of each side of the brain correspond with muscular groups upon the opposite side of the body, trouble in the right side of the brain causes paralysis on the left side of the body, and vice versa. Injuries to the skull and abscess and tumor of the brain are other causes of paralysis. In case of injury to the spinal cord, the patient ceases to have the power of movement below the point of injury. There are certain diseases of the cord, notably infantile paralysis and spinal meningitis, that cause loss of muscular movement. In some instances, though these are the exceptions, paralysis is a symptom of disease of the affected muscle.

Treatment of paralysis is determined by the nature of the disease, or of the injury causing it. Exercises, massage, electrical treatments, and use of splints or other apparatus are among the measures employed to help paralytics recover the use of affected muscles.

[*Paralysis* is derived from a Greek word meaning *to disable the side.* The term *paresis* is applied to a condition of partial paralysis.] W.A.E.

Related Subjects. The reader is referred in these volumes to the following articles

Apoplexy	Meningitis
Infantile Paralysis	Nervous System

PARAMARIBO, *pair ah mair' ih bo.* See DUTCH GUIANA (Cities).

PARANÁ, *pah rah nah',* one of the most important rivers of the world, and, next to the Amazon, the largest in South America. It is formed in the southern part of Brazil by the uniting of the Rio Grande and the Paranahyba, and flows in a general southerly direction through Brazil, between that country and Paraguay, and between Paraguay and Argentina, then through Argentina until it finds an outlet into the Atlantic Ocean, through the estuary of the Plata (see RIO DE LA PLATA) Near Corrientes, on the boundary between Paraguay and Argentina, it is joined by its largest tributary, the Paraguay River (which see). At the head of the Plata estuary it is joined by the Uruguay The total length of the river, from the confluence of the Rio Grande and the Paranahyba to the ocean, is 2,450 miles, excluding the Plata, it is 2,200 miles. It has a drainage basin nearly equal to that of the Mississippi, and it is about the length of that stream, excluding the Missouri

Below its confluence with the Paraguay, the Paraná traverses the level pampas of Argentina, and for a distance of a thousand miles is navigable for large river vessels Ocean-going steamers sail through the Plata estuary and up the stream as far as Rosario, Argentina, 400 miles from the Atlantic. In its lower course the Paraná divides into numerous channels, some of which are two miles in width Above its confluence with the Paraguay are several cascades and rapids, including the magnificent Victoria Falls of the Iguassu See map, SOUTH AMERICA

PARANASAL SINUSES, *pair ah na' zal si' nus ez.* See BONE (Structure).

PARANOID, OR **PARANOIAC,** *pair ah-noi' ak,* descriptive of a mental state. See INSANITY

PARA, *pah rah',* NUT. See BRAZIL NUT.

PARAPHASIA, *pair ah fa' zhih ah,* a form of aphasia (which see).

PARASELENAE, *pair ah se le' ne* See PARHELION.

PARASITA, *pair ah si' tah,* a suborder of the Hemiptera (which see).

PARASITE. A person who is too lazy to work, but not too proud to accept food and shelter from someone else, is called a *human parasite.* In a situation of this nature, parasite is used as a term of contempt. In botany and zoology, we find numerous plants and animals upon which other plants and animals feed and live, deriving from these organisms, called their *hosts,* the nourishment necessary to sustain life. There are a great many parasites that do their hosts no harm, but the scientist is concerned chiefly with parasitic organisms that are injurious in some way. Upon these parasites unending warfare is waged.

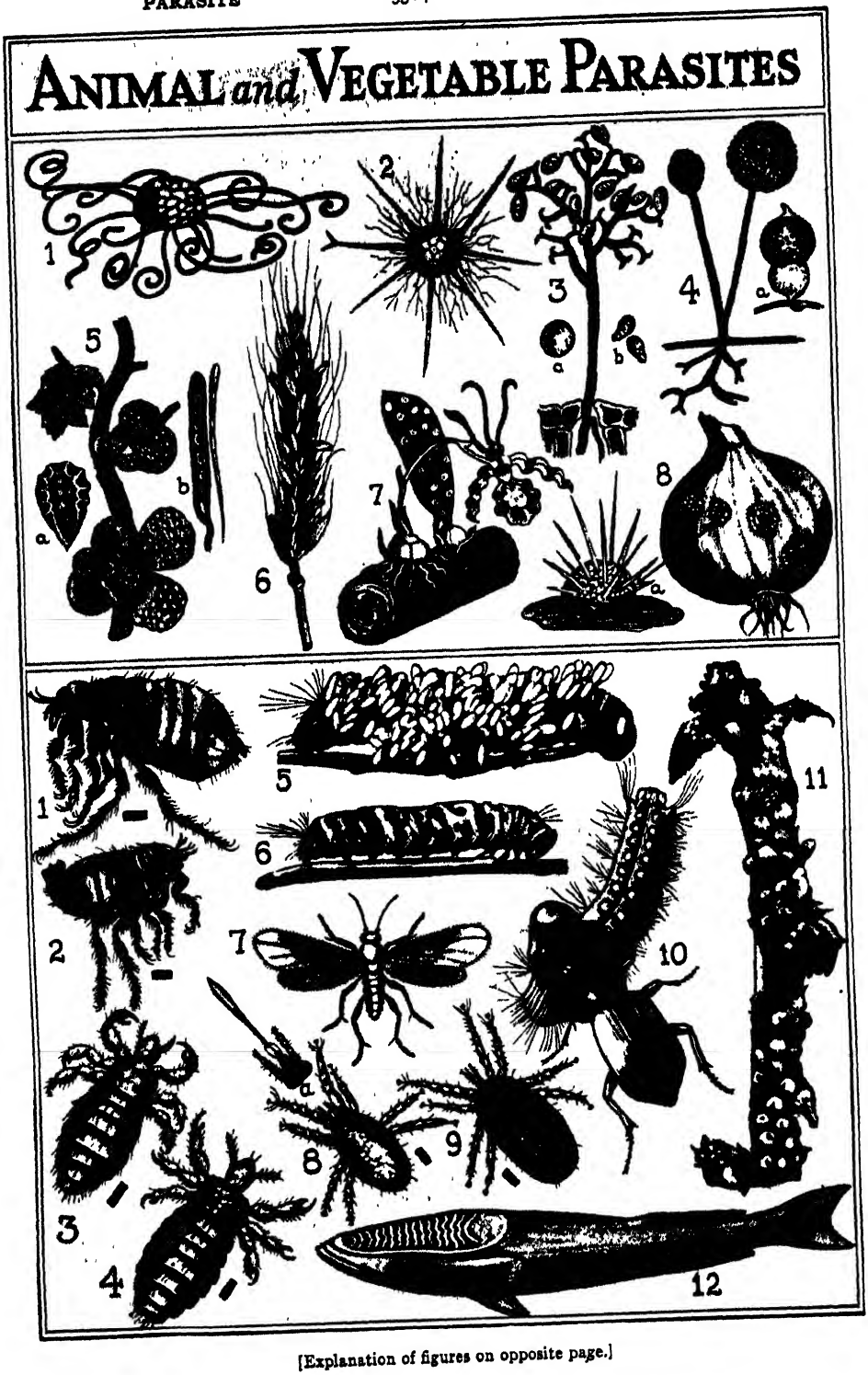
Animal Parasites. Domesticated animals, including poultry, are attacked by numerous animal parasites These harm their hosts by irritating the skin, by sucking blood, by setting up diseased conditions in the internal organs, and by carrying disease germs to their victims, these germs finding entrance through bites or other openings made by the parasites. Lice and fleas are common blood-sucking parasites. Mites burrow into the skin of their victims and cause various itching diseases. One species of tick transmits the dreaded Texas cattle fever Flies carry anthrax, another deadly disease. Grubs of a species of botfly live under the skin on the backs of cattle, reducing the quality of the hides and making the animals unhealthy. Other botfly grubs live in the stomachs of horses and in the heads of sheep Animals are also infested by such internal parasites as the tapeworm and the trichina.

Man is annoyed by mosquitoes, flies, bedbugs, lice, fleas, mites, and jiggers, among the external parasites Mosquitoes infect him with malaria and yellow-fever germs, flies are carriers of typhoid, fleas transmit bubonic plague, and the body louse carries typhus fever In addition, the parasites mentioned irritate the skin and sometimes cause festering sores. A certain mite causes itch. Hookworms, tapeworms, and the trichina are among the internal parasites that infest man and cause diseased conditions.

Aphides (plant lice), scale insects, and eelworms are common animal parasites causing diseases of plants. Some of these tiny creatures are "fearfully and wonderfully made," and could they grow to the size of a dog or a sheep, they would be more hideous than were the monsters whose fossils are found in the rocks of a past geologic age The smallest of the aphides are good examples of this sort of parasite Plants are also attacked by mites, some of which cause gall-like growths.

There are various insects that live on other insects. These must be reckoned among the friendly parasites, in so far as man is concerned. The United States Department of Agriculture is carrying on an intensive study of the parasites that feed on the corn borer, Japanese beetle, gypsy moth, and other enemies of American crops, and entomologists are vigorously encouraging the distribution of these parasites as one method of controlling the injurious insects.

Plant Parasites. A host of plant diseases are caused by parasites of the vegetable kingdom. Fungi, for instance, are responsible for downy mildew on grapes, alfalfa, and numerous garden



[Explanation of figures on opposite page.]

vegetables; for stem rust of wheat and other grains; for black-spot canker of the apple; for smut of corn; and for potato blight, to mention but a few among hundreds. Dodder, a twining seed plant, is a well-known parasite on clover and alfalfa. Mistletoe is a familiar parasite of forest trees, but it has green leaves, and therefore makes part of its own food (see CHLOROPHYLL). Such a plant is said to be a *partial parasite.* Dodder and mistletoe are among the largest vegetable parasites in the temperate regions. In tropical forests are found many parasites which grow to large size and kill the trees upon which they live.

Bacteria, which are microscopic one-celled plants, are, strictly speaking, parasites, causing numerous diseases of plants, man, and animals In respect to man and animals, however, it is customary to make a distinction between bacterial diseases and those caused by other parasites. Ringworm is an example of a true parasitic disease of man caused by a fungus, or plant parasite. See PARASITIC DISEASES W.J.S.

Related Subjects. In these volumes, the reader will find descriptions of the various parasites, together with valuable supplementary information, in the articles listed below See, also, ZOOLOGY (How Zoology Affects Human Welfare)

Aphides	House Fly	Phylloxera
Bacteria	Itch	Ringworm
Bedbug	Jigger	Rusts
Botfly	Louse	San José Scale
Disease	Malaria	Scale Insect
Dodder	Mange	Smuts
Flea	Mildew	Tapeworm
Fly	Mistletoe	Tick
Fungi	Mites	Trichina
Hookworm	Mosquito	Yeast

PARASITIC, *pair ah sit' ik,* **DISEASES** are diseases caused by plant and animal organisms that live in, or on, and derive their sustenance from, the bodies of other plants and animals, including man. Such organisms are called *parasites.* According to the general application of the term, parasitic diseases include those caused by germs, that is, by bacteria (plant microörganisms) and by protozoans (animal microörganisms). Because of the outstanding importance of microörganisms in affecting the health of man, the study of human bacterial and protozoan diseases is usually considered a separate department of medicine, and the name parasitic diseases is reserved for those caused by other organisms. It should be borne in mind that the name germ applies only to one-celled organisms.

Using the term in its restricted sense, that is, excluding bacterial diseases, we may divide parasitic diseases of man into two general classes, those due to plant organisms, and those due to animal forms. Among the malignant plant parasites is a yeast fungus that causes an eruption on the face and hands and elsewhere, often leading to disfigurement. The disease is called *blastomycosis.* Another fungus causes tumors and abscesses in the mouth and elsewhere. The disease, known as *actinomycosis,* is identical with lumpy jaw of cattle and other animals. Probably the most common of the fungous diseases of man is *ringworm,* of which there are several types. There are various other skin diseases due to fungi. Disorders of this type are not common among people who observe cleanly habits.

The diseases caused by animal parasites are numerous and widely distributed *Tapeworms* and *trichinae,* which are taken into the body through the medium of meat, lodge in the intestines, but trichinae eventually lodge in the muscles. *Hookworm* disease, an intestinal disorder, is caused by a roundworm that usually enters the body through the legs and feet The hideous tropical disease called *elephantiasis* is caused by a threadlike worm transmitted by the bites of mosquitoes.

Scabies and some other skin diseases are caused by the bites of *mites,* small creatures belonging to the same class as spiders. Among the true insects causing skin diseases are the tropical *jigger flea* and *head* and *body lice.* The larvae, or young, of various *flies* sometimes are responsible for serious diseases within the body. Most of the insects, however, that are agents in causing disease, carry in their bodies malignant germs which are transmitted to the victims through bites. Elephantiasis, mentioned above, is a parasitic disease transmitted by parasitic insects. Malaria, yellow fever, bubonic plague, typhus fever, and African sleeping sickness are bacterial or protozoan diseases transmitted by parasitic insects. As indicated above, it is entirely correct to call the latter parasitic diseases. The distinction is merely based on custom and convenience. W A.E

Related Subjects. For supplementary information, the reader is referred in these volumes to the articles PARASITE and DISEASE, and to the articles indexed therewith

PARAVANE. See SUBMARINE (Protection of Ships; WORLD WAR, pages 7879-7880).

TWENTY COMMON PARASITES

Vegetable. (1) Powdery mildew of vine (2) Hazel leaf mildew (3) Onion mildew. (4) Bread mold (5) Tree morel on living branch of myrtle tree (6) Ergot on rye (7) Orchid. (8) Onion scab
Animal. (1) Flea, female. (2) Flea, male (3) Head louse (4) Body louse. (5) Cocoons of ichneumon fly on caterpillar (6) Caterpillar from which ichneumon parasites have issued, leaving exit holes in the skin. (7) Adult ichneumon fly. (8) Chicken mite, female, before feeding. (9) Same, after feeding (10) Caterpillar of gypsy moth. (11) Colony of black peach aphides on peach twig. (12) Ramora, with dorsal fin modified into a sucking plate, by which the fish attaches itself to a shark

PARCEL POST. In recent years the leading nations of the world have sought new ways in which to realize for the people additional benefits from their postal systems. In no direction have they met with greater success than through the transportation of packages by mail, a business which has come to be known throughout the world as the parcel post.

All countries in Europe place great dependence upon their parcel-post systems, for what in the Western world are called express companies are almost unknown to them. Regulations vary greatly in the different nations.

In the United States. Prior to the year 1913, it was permissible to ship merchandise by mail, but the weight of the package was limited to four pounds and the price charged was high—sixteen cents a pound. What the people needed was a means of sending merchandise of the most varied description, in parcel lots, with a weight limit much greater than the old regulations allowed, and at far lower rates.

As the experience of other nations had shown that such requirements were not unreasonable, Congress passed a bill, August 24, 1912, the same to become effective January 1, 1913, authorizing the Postmaster-General to work out the details necessary to establish a parcel-post system, at the same time giving him the right to make modifications of regulations in the future, as to weight, rates, classification, etc.

According to the regulations in force since May 1, 1918, packages containing merchandise of the most varied description—all forms of factory, farm, and dairy products, such as butter, cheese, eggs, meats, and vegetables, and articles of all kinds—are admitted to the mails, provided they are properly packed, and do not fall under the heading of unmailable articles, such as explosives. Mail of this type is called fourth-class matter. A collect-on-delivery plan has also been added, so the government not only carries the package, but it collects the money due and remits it to the shipper. For a small additional fee, insurance against loss can be purchased, or if time is an object, the shipper can have the benefit of special delivery. Fourth-class mail with a destination within the United States, Guam, Hawaii, the Philippine Islands, Virgin Islands of the United States, Porto Rico, and the Canal Zone may be registered if it is sealed, and postage at the first-class rate, plus the registry fee, is paid.

A new service called *special handling* has also been added. By the payment of an additional fee of ten cents for parcels weighing under two pounds, fifteen cents from two to ten pounds, and twenty cents for parcels weighing more than ten pounds, the package will receive the expeditious handling, transportation, and delivery accorded first-class mail. Special handling does not include special delivery.

A package weighing seventy pounds can be sent any distance up to and including a distance of 300 miles from the sending office; a package weighing fifty pounds may be sent any distance within the United States; one of eleven pounds to most of the leading nations of the world. The limit of weight has been changed several times, and doubtless further changes will be made. To guard against unwieldy packages, it is required that the parcel must not be more than eighty-four inches in length and girth combined. The minimum weight is eight ounces, and parcels weighing less than that go under third-class rates. If one desires to send a letter or communication with a parcel, he may place it in an envelope, addressed and stamped with the required first-class postage rate, and attach it to the outside of the parcel. Any writing enclosed in the package subjects it to first-class-postage rates.

The method of determining the amount of postage required is one of the most interesting features of the system. It appeared impossible for the United States to adopt a "flat" rate, that is, to estimate the postage according to weight only, and charge the same for all distances, as in all other mail matter Manifestly, charges must be estimated according to weight and distance, and this necessitated the adoption of a zone system A carefully prepared map of the United States is divided by cross-lines into quadrangular areas, one-half of one degree in length and breadth (about thirty miles square), called units of area These units are numbered in regular succession, beginning with number 1 in Porto Rico and ending with number 5,803 in the state of Washington But since the location of a number of these units falls in the Great Lakes, the Gulf of Mexico, the oceans, and some in Canada, there are only 3,500 numbered squares in the land area of the United States.

Each of this latter number of units becomes the center of a system of zones, formed by drawing seven concentric circles (that is, circles with a common center but with varying diameters), whose radii are 50, 150, 300, 600, 1,000, 1,400, and 1,800 miles respectively, thus dividing the United States, with respect to each unit, into seven zones The eighth zone includes all units outside of the seventh zone. The rates of postage vary according to the zone in which the delivery office is situated in respect to the sending office. A moment's reflection shows that only those offices located in the same unit can have the same system of zones, therefore it was necessary to prepare 3,500 different maps to serve the needs of all the postoffices in the United States, and to give them their correct parcel-post regulations.

This is not as complicated as it appears to be. A very little study enables a postmaster to determine the zone in which an office is

located with respect to his office. By referring to the parcel-post guide which his office possesses, he can see the number of the unit in which another office is situated; then by examining the map made for his locality, he readily sees the number of the zone in which any other place is located. The following table, then, enables him to estimate the amount of postage required.

WEIGHT	LOCAL ZONE	FIRST UP TO 50 MILES	SECOND UP TO 150 MILES	THIRD 150 TO 300 MILES	FOURTH 300 TO 600 MILES	FIFTH 600 TO 1,000 MILES	SIXTH 1,000 TO 1,400 MILES	SEVENTH 1,400 TO 1,800 MILES	EIGHTH OVER 1,800 MILES
1 lb	$0 07	$0 07	$0 07	$0 08	$0 08	$0 09	$0 10	$0 12	$0.13
2 lbs	08	08	08	10	12	15	18	22	.25
3 lbs	.08	.09	09	12	16	.21	26	32	37
4 lbs.	09	10	10	14	20	27	34	42	49
5 lbs	.09	11	11	16	24	33	42	52	61
6 lbs	10	12	.12	18	28	30	50	62	73
7 lbs	10	13	13	20	32	45	58	72	85
8 lbs	11	14	14	22	36	51	66	82	.97
9 lbs	11	15	15	24	40	57	74	92	1 00
10 lbs	12	16	16	26	44	63	82	1 02	1 21
11 lbs	12	17	17	28	48	69	90	1 12	1 33
12 lbs	13	18	18	30	52	75	98	1 22	1 45
13 lbs	13	19	19	32	56	81	1 06	1 32	1 57
14 lbs	14	20	20	34	60	87	1 14	1 42	1 69
15 lbs	14	21	21	36	64	93	1 22	1 52	1 81
16 lbs	15	22	22	38	68	99	1 30	1 62	1 93
17 lbs	15	23	23	40	72	1 05	1 38	1 72	2 05
18 lbs	16	24	.24	42	76	1 11	1 46	1 82	2 17
19 lbs	16	25	25	44	80	1 17	1 54	1 92	2 29
20 lbs	17	26	26	46	84	1 23	1 62	2 02	2 41

For parcels above 20 pounds, in the first three zones, the rate increases in the same proportion until the 70-pound limit is reached

International Parcel Post. Almost all foreign countries have some kind of provision for parcel-post service. The rates, size of parcels, kind of prohibited articles, and customs regulations are specified by each country. For such information, consult the nearest postoffice.

PARCHMENT, material made from the skins of sheep, goats, and other animals, used principally as writing material. The finer grades, called *vellum,* are made from the skins of calves, kids, and stillborn lambs. The word *parchment* is a corruption of *Pergamum,* the name of a city in Asia Minor, where the material was made in ancient times. Writing on skins is older than recorded history; the earliest kings of Egypt used parchment. Papyrus, in fact, is of later date, and came into use because parchment was so expensive (see PAPYRUS). For writing on parchment, brushes similar to those used by Chinese laundrymen were employed, or soft reeds sharpened to a blunt point.

Parchment is prepared by removing the wool or hair from the skin, placing the latter in lime to discharge the fat, then stretching it upon a frame and dressing it with knives and scrapers. Pulverized chalk is rubbed on with pumice stone, to smooth and soften the skin and to obtain a uniform thickness. The heavier parchment used for drumheads is made from the skins of asses, older calves, wolves, and goats. The finer grade is used for important writings, such as charters, university diplomas, wills, etc. Parchment is utilized for these purposes because it lasts longer than paper and is more resistant to tearing and other accidents. See page 5368.

Parchment paper, or vegetable parchment, first manufactured in 1857, is used for legal documents, maps, etc., and for connecting laboratory apparatus. This is made by dipping pure, unsized paper into a cooled mixture which consists of two parts of sulphuric acid to one part of water, then washing, and finally drying under pressure.

PARDON, in law, is the remitting, in whole or in part, of punishment imposed for the commission of a crime. The power of pardoning offenses against the United States is vested by the Constitution in the President, and extends to all cases except those of impeachment. The power of pardon in the various states usually rests with the governor; a few states require the sanction of one branch of the legislature, and some have a state board of pardons, of which the governor, *ex officio,* is a member, and to which applications for pardon must be made.

Pardons consist of three classes, *absolute, conditional,* and *general.* An absolute pardon frees the person without any condition, a conditional pardon is one in which certain conditions must be complied with; a general pardon applies to a group of offenders guilty of the same offense. *Commutation of sentence* lessens the term of punishment, while a *reprieve* is a suspension of a death sentence for a specified time that results in delay of execution. Since the laws of the different states vary in detail, one interested in the subject should consult the laws of his state. See, also, PAROLE.

Canada. In Canada pardons are granted by the Crown; that is, by the Governor-General in Council. A commutation of sentence is also granted by the same authority. A reprieve may be granted by the judge of the court before whom the trial was held, or by any other judge qualified to sit in that court, provided the Governor-General believes royal mercy should be extended, or that some point of law relating to the conviction has not been decided.

PAREGORIC, *pair e gor' ik,* a solution containing two grains of opium for every fluid ounce of other ingredients. Its sale to the public is forbidden. See OPIUM.



Photo: Keystone

No Change in Methods from Ancient Days. On a site near Portsmouth, England, tradition declares parchment has been made for about a thousand years. The illustration shows a workman shaving a dry skin, to remove all rough spots and to reduce it to required thinness (See page 5367.)

PARENT AND CHILD. Between the present day and the time of the early Romans, when a father had power of life and death not only over his own children, but over his grandchildren as well, there has been a revolution in public sentiment regarding children. Property right in children gradually gave way to guardianship, and to-day the welfare of a child is considered equal or superior in importance to the legal rights of others to control him. Some of this change in thought came early enough to be expressed in English common law, which is followed in both the United States and Canada, but part of it is embodied only in statutes, which differ in each state and province.

Parents' Rights and Responsibilities. The father of children, or the mother, if she is the legal head of the family, must support them and educate them. Parents may correct and punish them when necessary, but for cruelty they are liable to prosecution for assault. Under many statutes, the state may take a child, for its own protection, out of the possession of its parents. In general, a parent is responsible for debts contracted or damage done by his child, but he cannot be punished for his child's misdemeanors. If the child is injured in service outside the home, the parent may sue for the loss of its services. The child retains the right to sue for personal injury. A child is generally entitled to a share in a deceased parent's property, but in some states it is not legally required to give a child anything by will.

Teachers' Duties and Responsibilities. Any person who temporarily or permanently assumes a parent's duties is considered at law to be *in loco parentis*, that is, *in place of the parent*. Thus a teacher may discipline a child, but must not indulge in cruelty (see CORPORAL PUNISHMENT). A public-school teacher cannot compel a pupil to study any subject against the wishes of its parents, nor punish it for obeying its parents, but the child may be excluded from the school. School authorities may expel pupils for breaches of discipline, general immoral character, or refusal to do prescribed work. In some states the courts have held expulsion to be legal when the parent offends in one of several ways: for example, by refusing to correct or permit the correction of a child; by refusing to sign and return reports of standing; or by using abusive language to a teacher in the presence of the pupils. L.L.B.

Related Subjects. The article above treats the subject from the legal side only Other aspects of the subject of the rights of children will be found in these volumes in the following articles·

Baby
Child, The
Child Labor
Children, Societies for
Children's Bureau
Child Study
Mothers' Pensions

PARENTHESES. See PUNCTUATION.

PARENT-TEACHER ASSOCIATIONS, AND NATIONAL CONGRESS OF PARENTS AND TEACHERS. What a wonderful thing it is that at last society as a whole has come to realize that there is more than one educational institution for the children! About thirty-five years ago, when the National Congress of Parents and Teachers was organized, only one great teacher of children was commonly recognized, and that was the *school* teacher. That the parents were teachers, that the next-door neighbors and others in the community were teachers, and that the Sunday-school "teachers" should be real teachers, had not yet been acknowledged. The National Congress of Parents and Teachers is especially interested in four of these educational institutions—the home, the school, the Church, and the community.

The home is the first school for the child, because it is the one into which he is born. As he opens his eyes upon this new and strange world, his education begins. His first teacher is his mother. How necessary, then, that this mother know something of the physical care of the child, of child psychology, of mental hygiene, of spiritual values. In these first few days, she begins the education of her baby. Then the next teacher enters, and from that time there are two teachers more or less constantly with the child as long as he or they live —the father and the mother. These two teachers must by conference and arrangement decide upon a set of standards to be followed by both—not two sets of standards. Why are children so often confused as to what to believe, and what to do? It is because the father believes and does one thing, and the mother believes and does another. Which shall the child choose to do, to believe?

The National Congress of Mothers was organized in Washington, D. C., in 1897. Its originator, Mrs. Theodore W. Birney, believed that mothers should take their task of motherhood more seriously and be better trained for it, because they were more constantly with the child during its early years than anyone else. From the first, mothers' study groups were organized among the mothers of pre-school children, where studies were made of the best ways of meeting the problems related to the training of the young child. The mothers carried the results of the discussion home to the fathers, and together they learned how to help the little one develop.

But young children have a way of growing up, and before long these mothers and fathers found the children going joyously to the next school—the public or private school taught by trained teachers. What was to be done now? Were mother and father to know nothing about this phase of school life of the child except the fragmentary reports brought home

by him? Because of the need for understanding between parents and teachers, parent-teacher associations sprang up, where parents and teachers together could work out the problems of later childhood and adolescence. Now the father came into the work more generally, as the meetings were often held at a time when he could attend. Here fathers, mothers, and teachers studied the best ways of working together to influence the child's development. The national organization now changed its name to the National Congress of Mothers and Parent-Teacher Associations.

But all of this time the child had been attending another school—the community—and the parent-teacher associations soon found that unless community conditions were right, unwise community teachers would be interfering seriously with the best work they could do. Then the parent-teacher associations began to work for better moving pictures in the town, supervised playgrounds and dance halls, community play days, greater safety on the streets, etc.

During many of these years, the child was attending the fourth school—the Church. If the education of the child was to be best accomplished, parents must be sure that the Sunday schools were taught by trained teachers, and that the Church-school standards were at least as high as the home and school standards. Parent-teacher associations in churches now developed. Can we not see how much confusion and uncertainty will be eliminated when the standards in the home, the school, the Church, and the community all become relatively high?

What, then, are the results of this educational work done by what has now become the National Congress of Parents and Teachers?

1. Through the summer round-up of the children's campaign conducted by the organization, parents are becoming cognizant of their responsibility to send into the school, at the age of five or six, children who are free from all remediable defects, are well nourished, have a well-developed control of the muscles, have a reasonably large and varied vocabulary, and have an awakened moral and spiritual nature already functioning—children who are ready for the school experience.

2. Through study circles, parents are realizing their opportunity and responsibility to send into school those children who are mentally alert and socially developed, so that they may from the first day be an asset to the school.

3. Through the parent-teacher associations, parents are realizing what the school is doing, how they may help the school to do its best work, and how necessary it is for the home to become the practice department of the school, where the theories taught in school may be tried out.

4. In states where parent-teacher demonstrations have been conducted, associations have been organized in eighty or eighty-five per cent of the schools. As a result of this more complete organization of parent-teacher groups, school terms have been lengthened, better-trained teachers have been demanded, and for the better training of these teachers, better salaries have been paid; better-equipped and better-housed schools have been developed, and better community spirit has been secured.

5. The National Congress and its state branches have endorsed projects looking toward better housing, better building codes, better playgrounds and parks, and better regional and city planning.

6. The National Congress has endorsed and worked for a Federal Department of Education with a Secretary in the President's Cabinet, for the enforcement of all law, for the national child-labor amendment to protect children from exploitation, and for the outlawry of war.

The National Congress of Parents and Teachers now has organized state branches in forty-seven states, in the District of Columbia, and in Hawaii, with a membership of one and one-quarter million, all working for better conditions for children.

A National Congress of Colored Parents and Teachers was organized, with the assistance of the National Congress of Parents and Teachers, in May, 1926. Now there are a number of organized state branches for colored people, with several thousand members. The same general policies are followed by both organizations.

The program of the National Congress of Parents and Teachers, given below, has appealed to all concerned as at once necessary, scientific, and practicable:

(1) To promote child welfare in home, school, Church, and community, to raise the standards of home life; to secure more adequate laws for the care and protection of women and children

(2) To bring into closer relation the home and the school, that parents and teachers may cooperate intelligently in the training of the child, and to develop between educators and the general public such united efforts as will secure for every child the highest advantages in physical, mental, moral, and spiritual education.

In 1927 an International Federation of Home and School was organized. The object of the international group is "to bring together for conference and coöperation all those agencies which concern themselves with the care and training of children in the home and school and community, and with the education of adults to meet these responsibilities." There are extraordinary possibilities in having the parents, the teachers, and all the lovers of childhood in many countries linked together in consultation to obtain a better knowledge of how to make the best of the children of the world. F.V.W.

PARESIS, *pair' e sis*, or *pah re' sis*, incomplete paralysis, which affects motion but not sensation. General paresis is general paralysis. See INSANITY.



PARIS FLIES WITH HELEN TO TROY

PARHELION, *pahr he' li on,* a false sun, appearing much like the sun, and seen best when the sun is near the horizon. It is visible on either or both sides of the sun, and at distances of 22° and 46°. Parhelia (the plural of *parhelion*) are due to reflection and refraction of light by crystals of ice in the higher regions of the atmosphere. Parhelia may be double, triple, or even more numerous, and are always connected with one another by a white halo or circle. Similar phenomena connected with the moon are called *paraselenae.* See CORONA; HALO. F B.L.

PARIAH, *pah' rih ah,* or *pa ri' ah.* See CASTE.

PARIETAL, *pah ri' e tal,* **BONES,** two of the eight bones of the head (which see).

PARIS, in Greek legend, the second son of Priam, king of Troy. His mother, Hecuba, having dreamed that he would cause the destruction of the city, decided that he should be left to perish on Mount Ida; but the servant to whom she had entrusted the abandonment of the child took it home and reared it as his own son, naming it Paris. As he grew to young manhood, Paris became famous for his courage and skill in protecting the shepherds from robbers. While on Mount Ida, he was married to the beautiful nymph Oenone.

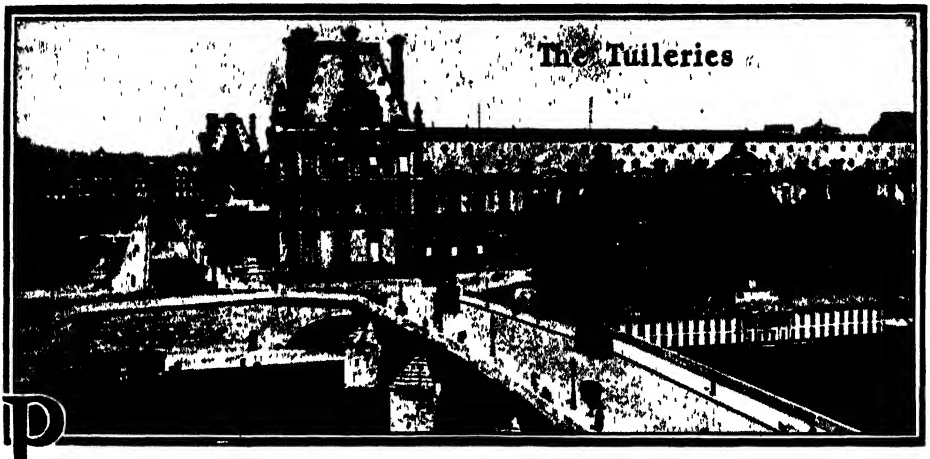
By his award of the Apple of Discord to Aphrodite (page 7280), Paris gained the enmity of Hera and Athena, which followed him persistently and brought disappointment and misfortune to him and his whole race. Soon after the unsatisfactory award, King Priam proposed to give as a prize to the winner of certain military contests the most beautiful bull in his kingdom. This animal was found in the possession of Paris, and was taken to Troy; and Paris, disliking to lose his treasured animal, entered the contest and distinguished himself by defeating all, even his own brothers. This so angered Hector that he would have slain Paris had not Cassandra identified him as the son of Priam, and her own brother.

Forgetting the misfortunes that Paris was to bring to his country, Priam adopted him, and shortly afterward sent him on a voyage to Greece, although Cassandra had prophesied nothing but misfortune would come of the expedition. Here Aphrodite remembered her

promise to give him the most beautiful woman on earth as his wife, and sent him to the palace of Menelaus, where he found Helen. During the absence of her husband, the king, Paris won her affections and carried her to Troy. Out of this episode the Trojan War developed. Though Paris distinguished himself in that conflict, he was always treacherous. It was he who killed the heroic Achilles, who had come, on the invitation of Priam, to the temple of Zeus to ask for the hand of Polyxena. Paris was wounded by the arrows of Philoctetes and fled to his former wife, Oenone, who had promised to cure him if he was wounded, but she was so angered at his desertion that she refused to aid him, and Paris died in agony. Then Oenone repented and threw herself upon his funeral pyre and was burned.

Related Subjects. The reader is referred in these volumes to the following articles

Achilles	Helen of Troy
Apple of Discord	Menelaus
Cassandra	Priam
Hector	Troy
Hecuba	Ulysses



PARIS, FRANCE. "The cradle of the freshest thought, the newest fashions, and the latest luxury; the paradise of pleasure-seekers; the most attractive jewel that glitters in the coronet of Mother Earth." So writes an enthusiast of this famous capital and metropolis of the French republic. It is a city that always charms and interests the traveler, not only because of the gayety that he finds there, but because of the beauty of the streets, public squares, and buildings—a beauty of line and proportion, of harmonious grouping and impresssive vistas.

Paris is the third largest city in Europe, ranking next to London and Berlin, and is the fifth in size in the world, having fallen behind Chicago, the great American city of the Middle West. Within the municipal limits, Paris has a population of about 2,900,000, but within the department of the Seine, consisting of the capital city and an extensive circle of suburbs, there are over four and a half million people.

Paris is located on a level plain in Northern France, on both banks of the Seine River. It is 285 miles southeast of London by way of Dover and Calais, and 110 miles in a direct line from the mouth of the river. The beautiful suburb of Versailles is twelve miles southwest, and Fontainebleau, with its celebrated château, is thirty-five miles northwest.

General Description. A distinctive feature of the general plan of Paris is the system of boulevards. The greater part of the oldest section of the city is encircled by what are known as the *Grands Boulevards*, built upon the ramparts constructed in the fourteenth, sixteenth, and seventeenth centuries. Beyond the Grands Boulevards are the old suburbs, and these in turn are enclosed by another circle of boulevards, coinciding with the ramparts of the eighteenth century. Outside of the latter are the newer suburbs (made a part of the city after 1860). Between 1840 and 1845, a wall over twenty miles long, with fifty-seven gates, was built around the city, but it was destroyed after the World War, together with the antiquated lines of forts shown to be so useless in modern warfare. A wide circular boulevard replaced the old wall, and the site of some of the old fortifications was given over to parks and playgrounds.

There are other wide and beautiful avenues traversing the city at angles with the line of boulevards, many of these being designated as *Rue*, the French word for *street*, or as *Avenue*. (*Boulevard*, in France, does not have the special meaning which it has in America. Many of the "boulevards" in and about Paris are paved with cobble-stones.) These attractive thoroughfares, spacious and beautifully clean, are lined with trees and seats, and on the side-

walks are small tables where rich and poor alike may gather for conversation and refreshment. There are miles of cafés, shops, and amusement places, and by day and night on the principal avenues one may see life in its most vivacious aspects.

The visitor in Paris is always impressed by the harmony of its architectural plan. The skyline presents no such contrasts as does that of Chicago or New York, for instance, for the buildings of Paris have been erected in accordance with laws designed to produce an effect of artistic unity. In the French capital, therefore, one never sees such incongruities as a huge, modern skyscraper beside an old, weatherworn building, three or four stories high. Light-colored limestone, which lends itself so readily to graceful ornamentation, has been quite generally used in the construction of both private residences and public buildings.

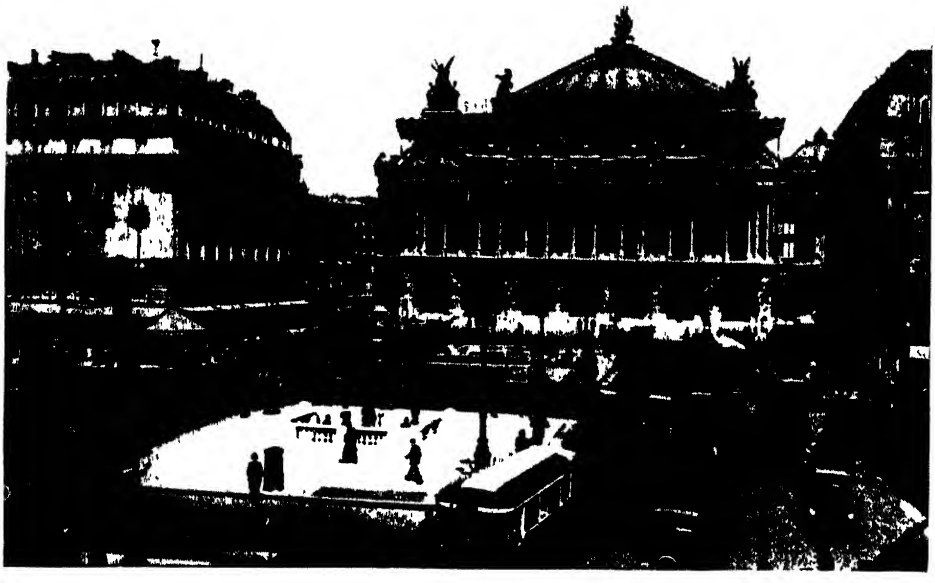
Public Squares, Parks, and Gardens. The open squares of Paris, numbering more than 130, are world-famous. In the heart of the city, on the north bank of the Seine, is the celebrated Place de la Concorde ("Place of Peace"), on the site of which Louis XVI and Marie Antoinette were guillotined during the French Revolution. In the center of the square, where once the death machine ceaselessly devoured its victims, there now stands the noble obelisk which centuries ago guarded the gateway to the Temple of Luxor, in Egypt Around the square are eight colossal figures symbolizing former provincial capitals, including Strassburg, in Alsace. As a perpetual emblem of the grief of the French people over the loss of their province in the Franco-German War, the Strassburg statue was kept decorated with crape-covered flags and wreaths, but since the restoration of the territory by the Treaty of Versailles (1919), flowers have replaced these symbols of mourning.

Leading westward from the Place de la Concorde is one of the finest thoroughfares in the world—Avenue des Champs Elysées. This connects the Place of Peace with another famous square, the Place de l'Étoile (Place of the Star). From the latter, twelve broad avenues radiate in all directions. The Champs Elysées is continued on the opposite side of the square by the Avenue de la Grande Armée. In the center of the square is a colossal Arch of Triumph erected in commemoration of the victories of Napoleon. Beneath this arch lies the grave of a hero of the World War—an unknown soldier of France whose memory is honored by a flame that never goes out. Here Marshal Foch's body lay in state in March, 1929. The largest park in Paris—the magnificent Bois de Boulogne—is located about a mile west of the arch, and the fine avenue connecting the two was renamed for Marshal Foch after his death. There is no longer in Paris an Avenue du Bois de Boulogne.

A few blocks east of the Place de la Concorde is the Place Vendôme, having as its most conspicuous ornament Napoleon's Column of Victory, which is decorated with bas-reliefs illustrating scenes from the campaign of 1805. Another well-known square in the vicinity of the Place de la Concorde is the Place du Carrousel, containing another of Napoleon's great triumphal arches. The Place de la Bastille, on the site of the famous state prison, the Place de la République, with an imposing bronze statue symbolizing the Republic, the Place de Rivoli, containing a famous equestrian statue of Joan of Arc, the



EIFFEL TOWER



GRAND OPERA HOUSE AND PLACE DE L'OPÉRA

The building was begun in 1861 and completed in 1874. It covers nearly three acres, and is the largest structure in the world devoted wholly to the theater, but it seats only 2,150

Place de la Nation, and Place Saint Michel are other handsome squares

Of the many attractive garden spots in the city none is of greater historic interest than the Jardin des Tuileries, adjoining the Place de la Concorde on the east. The famous royal palace was destroyed in 1871 by the Communists, but the grounds have been converted into a beautiful public park which the children use as a playground and their elders as a recreation spot and promenade. The garden is bordered on one side by a fine broad avenue, the Rue de Rivoli, and on the other by the swiftly flowing Seine; from its terrace along the bank of the river a magnificent view of the city may be obtained.



Photo- OROC

THE ARCH OF TRIUMPH, ON THE PLACE DU CARROUSEL

Erected to commemorate the victories of Napoleon from 1805 to 1809. It was modeled after the arch of Septimius Severus. [This is not the arch of triumph shown on page 369.]

Across the river to the south are the Gardens of the Luxembourg, with their beautiful Observatory Walk, conservatories, palace, and art gallery, the latter a museum of contemporary French painting and sculpture. On this side of the river, too, are the spacious grounds of the Hôtel des Invalides (the home for old soldiers), beneath the dome of which rests the great sarcophagus containing the ashes of Napoleon; the Jardin des Plantes, with a famous collection of plants from all parts of the world, and the Champ de Mars (Field of Mars), containing the Eiffel Tower. From this lofty elevation, the tallest structure in Europe, a powerful radio station is operated, the highest in the world.



Fountain of the Medici. Typical statuary in the Luxembourg Gardens. Paris art is very ornate. See MEDICI.

Notable Buildings. The first public building in point of interest is the Louvre, notable for its architectural beauty and its priceless art treasures. It extends along the Seine for half a mile and adjoins the east end of the Garden of the Tuileries. Originally, the Louvre was connected with the royal palace destroyed in 1871. North of it is the Palais Royal, built by Cardinal Richelieu about 1630. This edifice contains the offices of the Ministry of the Colonies. The Bourse, or Exchange, an artistic building adorned with sixty-six Corinthian columns, is north of the Palais Royal. A few blocks east of the Louvre is one of the most magnificent structures in the city—the Hôtel de Ville, built in French Renaissance style. It contains the offices where the municipal business of the city is transacted. In the same vicinity, on an island in the Seine known as Île de la Cité, is the great Palais de Justice, the headquarters of the law courts and police department. This structure contains the old Conciergerie, the prison in which Marie Antoinette and Robespierre were confined during the revolution.

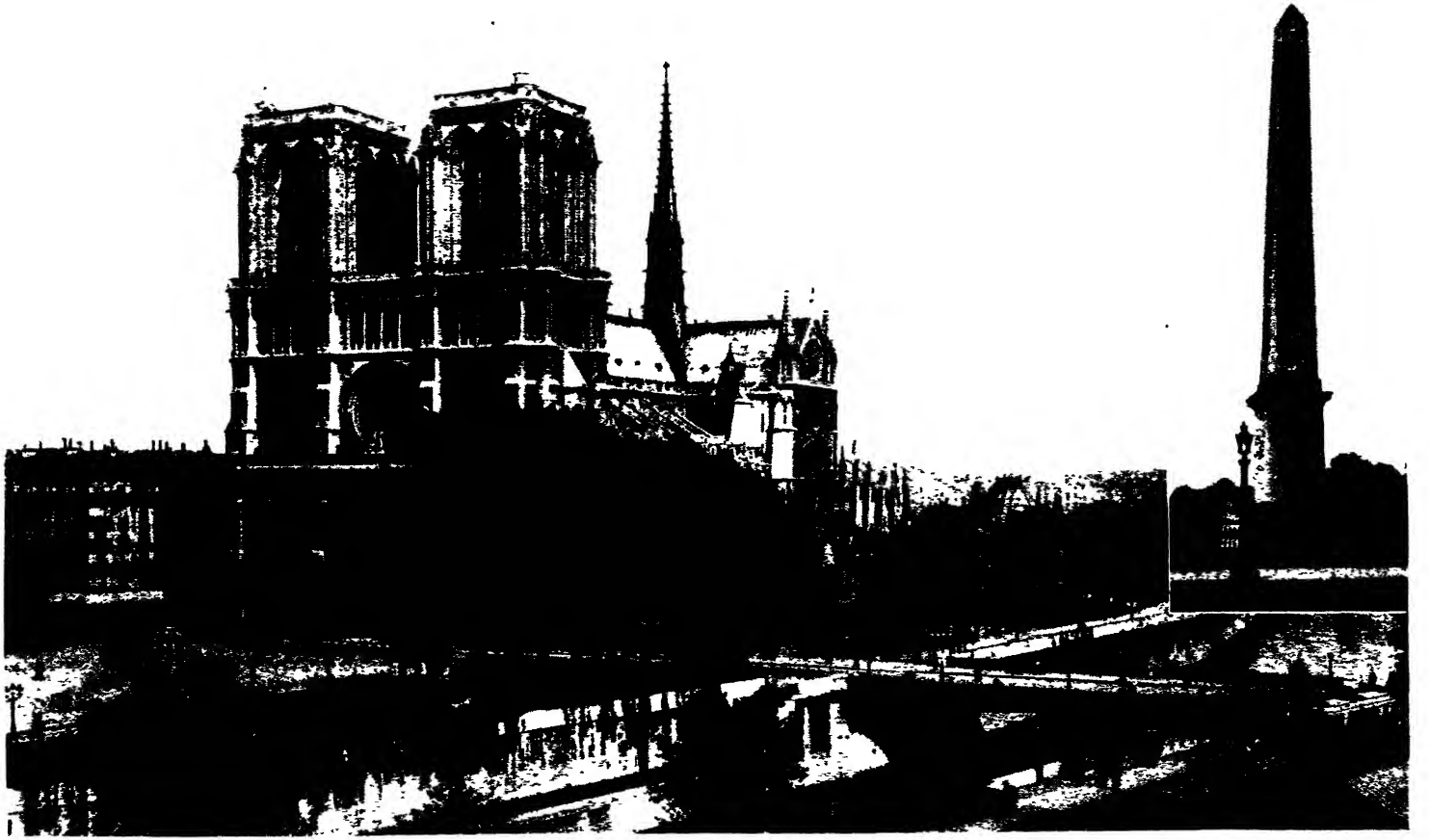


THE PANTHEON
In the crypt are the tombs of illustrious Frenchmen, including those of Victor Hugo, Voltaire, and Rousseau The building was modeled after the Pantheon at Rome

The Palace of the Trocadéro, located across the Seine from the Eiffel Tower, is a huge Oriental building in the form of a crescent. It was erected in 1878 for the International Exposition, and now houses museums of sculpture, antiquities, and ethnography. Northwest of the Place de la Concorde are the Palais de l'Elysée, the residence of the French President, and the Palais des Beaux Arts (Palaces of the Fine Arts), two beautiful structures erected for the exposition of 1900. The Grand Palais houses the annual Paris Salons, or exhibitions of art. The executive mansion is on one side, and the two art buildings on the other side, of a little park forming the lower end of the Champs Elysées. On the south side of the Seine, in a direct line with the Louvre, is the beautiful Luxembourg Palace, referred to above, the building in which the French Senate holds its sessions. Near by is the Pantheon, which has by turns been a church and a temple of fame. The lower house of the National Assembly, the Chamber of Deputies, has its sittings in the Palais Bourbon, on the south side of the Seine opposite the Place de la Concorde. Of many fine theater buildings, the largest is the Grand Opera House, occupying an area of nearly three acres.

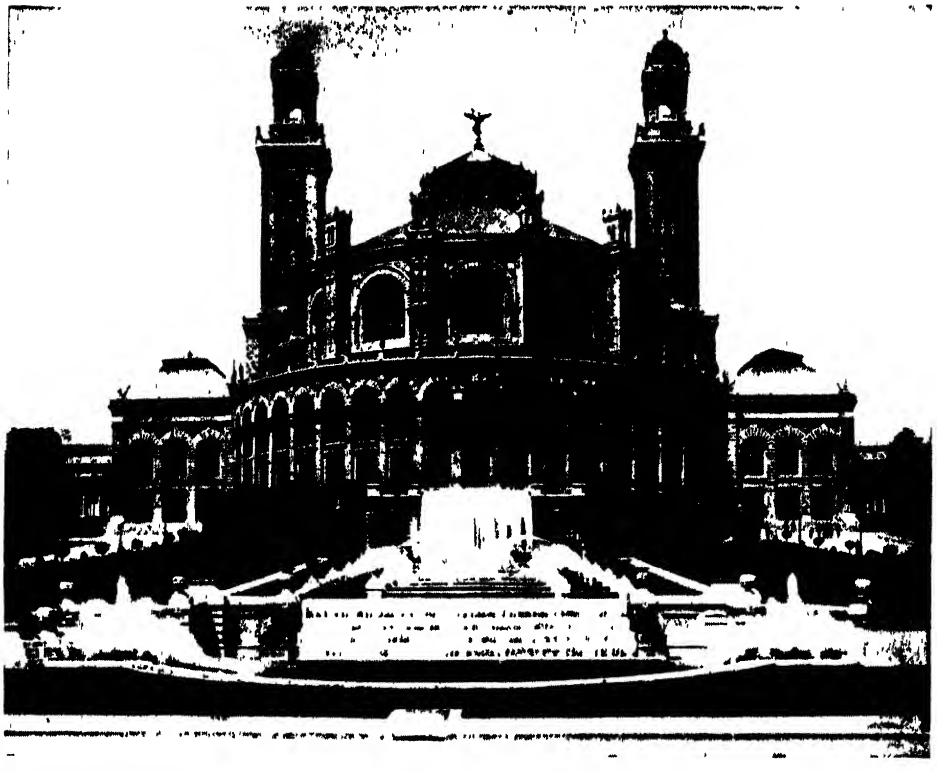
Churches. The largest and finest of the religious buildings of Paris is the Cathedral of Notre Dame, built during the twelfth and thirteenth centuries and restored between 1846 and 1879. The Church of Madeleine is in the style of a Greek temple, and is surrounded on all sides with a line of Corinthian columns. The interior is walled and paved with marble, with decorations in gold and other rich colors. Through the stained-glass windows of the dome marvelous lights shine on polished columns and on wonderful pieces of sculpture, fresco, and painting. The Church of the Sacre-Coeur (Sacred Heart) was erected on Montmartre, the highest point of Paris, in 1874-1891. Among other notable churches are the Sainte-Chapelle (1245-1248), containing stained-glass windows of unsurpassed beauty; and Saint Gervais, which was damaged during the World War by a German seventy-mile gun. The church has been carefully repaired.

Museums and Educational Institutions. The richest art treasures of the city are housed in the Louvre. In the Museum of the Luxembourg, adjoining the palace of that name, are kept the works of living painters and sculptors. These collections are the property of the state, and the finest works are transferred to the Louvre ten years after the death of the artists. The Cluny Museum, occupying the ancient mansion of the abbots of Cluny, the Carnavalet Museum, the Petit Palais des Beaux Arts, and the Trocadéro Palace are other important



Cathedral of Notre Dame. An excellent view of the great cathedral and the Seine River. When the building was planned, it was expected that two spires would be added, but this never was done. Thus the square-topped towers are explained In the inset is a sister monolith to Cleopatra's Needle; it is in the Place de la Concorde.

5377



PALACE OF THE TROCADÉRO
It is the home of a national theater, with a seating capacity of more than 4,000, and several museums, including one of sculpture.

homes of art collections. The chief educational institution is the University of Paris. Other well-known institutions are the Sorbonne, College of France, the Polytechnic School, the School of Law, the School of Medicine, the Observatory, and the Botanical Garden (Jardin des Plantes). All of these institutions are located in what is known as the Latin Quarter. Of the various libraries, the Bibliothèque Nationale is the largest and most famous.

Transportation and Industry. Local transportation is taken care of by means of electric tramways, an underground railway system (called the "Metro"), motorbuses, and taxicabs. In efficiency and in cheapness of fare, the cab system of Paris is unsurpassed. The Seine, which is from 300 to 500 feet wide along its course within the city, is spanned by over thirty bridges, many of which are adorned with parkways, statuary, and historic relics. The Pont Alexandre III, crossing the Seine just south of the two Palais des Beaux Arts, is accounted the most beautiful bridge in the world. All of the bridges are directly connected with quays which line the river banks; these quays are made attractive by trees, and contribute materially to the charm of the city. The six railway systems entering Paris have terminal buildings of massive proportions and palatial beauty.

Not only is Paris an important railway center, but it is the world's greatest center for air transportation. From Le Bourget, just outside the city, there are almost hourly commercial passenger lines through the air to seventeen other capitals. Paris is only eight hours from Berlin by airplane, and but two hours from London, though seven and one-half by rail and water. In 1927 a lone American airman, Charles A. Lindbergh, starting from New York, landed at Le Bourget after thirty-three hours of continuous flying, accomplishing the first non-stop flight from New York to Paris.

The French capital has a unique and well-deserved reputation for the high grade of its articles of luxury, such as perfumes, gloves, artificial flowers, and jewelry. These are made in small industrial establishments which utilize the finest skill available. The Gobelin tapestries, made in the southern part of the city, have been famous for centuries. Of increasing importance are those larger establishments producing automobiles, machinery, railroad sup-

plies, chemical products, soaps, dyes, leather, and other commodities. Distinctive among the features of industrial Paris are the great city markets, specialty shops, and the large department stores. As a center of trade the French metropolis outranks all other cities of the republic, and all of the important commercial, industrial, and banking companies of France have offices there. As one of the most popular tourist cities in the world, Paris has numerous travelers' agencies serving many different nationalities. Several English and American editions of daily newspapers are published in the city.

Government. Paris is divided for governing purposes into twenty *arrondissements*, or districts. The head of the municipal government, called prefect of the Seine, is appointed by the national government. Each arrondissement sends four elected members to a municipal council, and each has its own mayor. This official, and his three assistants, are appointed by the President. An arrondissement takes care of the assessment and collection of taxes within its own limits, and is a local center for educational and charitable work. The Paris plan of city government is one of the most admirable in the world in its practical effects, and there is in operation a satisfactory plan of civil service appointments. The sewerage, water-supply, and street-cleaning systems are managed with the highest degree of efficiency, as are matters of health and sanitation, charity, and education.

History. Julius Caesar, in his *Commentaries*, describes a small collection of huts called Lutetia, on the banks of the Seine This obscure village, the chief settlement of the Parisii, a Gallic tribe, occupied the site of the magnificent city of to-day. As a Roman colony the settlement spread out on both sides of the river, and the present name began to be applied in the fourth century. Clovis, founder of the Frankish monarchy, made Paris his capital, and in the tenth century it became the headquarters of Hugh Capet and the seat of government of the French kingdom During the Middle Ages, the city grew steadily, and the kings up to the time of the French Revolution did much to enlarge and beautify it

After the Revolution, Napoleon ordered the construction of new buildings, public gardens, arches, bridges, and other improvements, and he spent millions of dollars in the restoration and arrangement of art and scientific collections. Napoleon III continued the work of beautifying the city, and to him more than anyone else Paris owes its magnificent system of boulevards. During the period of the Commune, many fine buildings were destroyed, but the city was restored to its former splendor within two years. In 1878, 1889, and 1900, Paris was the home of great international exhibitions.

Questions on Paris

(An Outline suitable for Paris will be found with the article "City.")

What was the Tuileries? When and by whom was it built, what part did it play in history, and when, and by whom, was it destroyed?

What and where is the tallest structure in Europe?

What are the *arrondissements*? What part do they have in the government of Paris?

What was the Bastille, and why is its destruction celebrated as a national holiday in France? What was done with the key?

What tragic historic event took place in the "Place of Peace?"

What change has taken place in the decorations of the Strassburg Statue?

How many bridges cross the Seine within the limits of Paris?

How many cities of Europe are larger than Paris? How many in the world?

What cities would you pass through in going from London to Paris by the usual route?

What is the Bois de Boulogne?

Who built the Palace of Versailles, and what interesting historical events took place in it?

For what is Fontainebleau famous?

How was the course of the Grand Boulevards about Paris determined?

What would you see on the sidewalks of Paris that you would never look for on the sidewalks of any American city?

What is the French word for *street*? For *star*? For *peace*?

How does the "skyline" of Paris differ from those of most large American cities?

What object may you see in Paris which a century ago might have been seen in Egypt?

What memorials are there to Napoleon?

Mention some of the chief art treasures of the Louvre

What is the Paris Salon, and where is it held?

When was the largest and finest religious building of the city constructed? Of what style of architecture is it typical?

How do the art treasures in the Luxembourg differ from those of the Louvre?

What does *Jardin des Plantes* mean? What does *Sacre-Coeur* mean?

From whom did the city of Paris take its name?

To whom does it owe its fine boulevard system?

What fate threatened the city during the World War, and how was it saved?

The city suffered a terrible siege in the Franco-German War, when the inhabitants were starved into surrender. During the World War, it was the chief objective of the German

invaders; in August, 1914, they were within forty miles of the city, which was saved by the Battle of the Marne. Again, in 1918, Paris was seriously in danger of capture. Repeatedly, in the spring of 1918, the city was bombarded by a great gun seventy miles distant, but the spirit of its citizens remained undaunted. Paris was the official headquarters of the Peace Conference that met after the close of the war, though the sessions were held in the Palace of Versailles, where the principal treaty was signed.

After the war, Paris was confronted with a serious housing problem, for it had to take care of a large new industrial population. The demolishing of the old fortifications provided room for some building, and thousands of private dwellings were erected in the suburbs and outskirts of the city. In 1921 public surface transportation was placed under one jurisdiction. Another progressive enterprise was the enlargement of the port of Paris and construction of several new ports. B.M.W.

Related Subjects. For detailed descriptions of many interesting features of Paris, and for other supplementary information, the reader is referred in these volumes to the following articles:

Alsace-Lorraine	Invalides, Hôtel des
Arch of Triumph	July Revolution
Bastille	Louvre
Bibliothèque Nationale	Notre Dame, Cathedral of
Capetian Dynasty	Obelisk
Champs Elysées	Pantheon
Clovis	Paris, University of
Commune of Paris	Salon, The Paris
Eiffel Tower	Seine
Fontainebleau	Sorbonne
France	Tuileries
Franco-German War	Versailles
French Revolution	World War

PARIS, Louis Albert Philippe d'Orleans, Count of (1838-1894), a claimant of the throne of France, and the second titled Frenchman to volunteer service in the cause of America. He was born in Paris, the son of the Duke of Orleans and grandson of King Louis Philippe. After his father's accidental death in 1842, he became heir apparent to the throne. At the outbreak of the American War of Secession, in 1861, in company with his brother, the Duke of Chartres, he sailed for America, and following the example of Lafayette in the Revolutionary War, offered his services in behalf of the Union. He joined the staff of General McClellan of the Federal army, and as a captain of volunteers, served with bravery at the Battle of Gaines's Mill, in 1862. During the latter part of that year, the Count of Paris returned to England, was married there to a cousin, and returned to France in 1871, after the downfall of Napoleon III. In 1873 he renounced his claim to the French throne. The Act of Expulsion, a measure passed in 1886 by the French republicans, forced him to leave France, and he afterward lived a retired life in England. In 1890 he revisited the United States.

PARIS, Tex. See Texas (back of map).

PARIS, Treaties of. Several treaties have been signed at Paris, the first in 1763. The more important are described below:

Treaty of 1763. This treaty was signed on February 10, bringing to a close the Seven Years' War in Europe. According to its terms, France gave up Canada, Prince Edward Island, and Cape Breton to the English, retaining only two small islands for its fishermen. All French territory east of the Mississippi River, except New Orleans and its island site, was also ceded to Great Britain, and that nation received a clear title to the possession of Nova Scotia. France likewise resigned to England its political supremacy in India. Spain ceded Florida to England, but to compensate the former country, France gave to Spain New Orleans, and all of Louisiana west of the Mississippi. The colonial empire of France was greatly weakened by this treaty, and England became the dominant power in North America and India.

Treaty of 1783. This treaty closed the American Revolution and established peace between Great Britain and its former colonies along the Atlantic coast. The United States was officially recognized as an independent nation. The treaty was signed on September 3, Franklin, Jay, and Adams representing the United States. It secured to the new nation the country west to the Mississippi River, measuring from a point west of the Lake of the Woods to 31° north latitude. The boundary then ran irregularly east to the Atlantic. The forty-fifth parallel was to be the northern limit. The United States retained its fishing rights in Newfoundland, as well as the exclusive right to fish on its own seacoast Congress agreed to restore the estates confiscated from British Loyalists during the war, and to abandon further prosecutions against them.

Treaty of 1814, signed on May 30, after the first abdication of Napoleon in April. The treaty restored to France most of its colonies, but French conquests were relinquished. England kept Ceylon, the Cape of Good Hope, and part of Guiana, which had been wrested from Holland. France gained a small amount of territory on its northern and eastern frontiers. Holland was returned to the possession of the House of Orange, Switzerland was recognized as independent, and Germany and Italy as consisting of independent states.

Treaty of 1815, signed on November 20, after Napoleon's final defeat at Waterloo. France lost the slight territories on its frontiers gained under the former treaty, and was ordered to pay indemnities. The French also had to submit to the occupation of the frontier prov-

inces by an allied army, as security for payment of indemnities.

Treaty of 1856, concluded on March 30, at the close of the Crimean War. The Black Sea was to be open to the merchant vessels of every nation, but forever closed to warships, including those of Russia and Turkey. The Danube River was declared to be open to free navigation and was placed under the control of an international commission. The powers agreed to recognize the independence and integrity of Turkey, and Russia was forced to renounce its protectorate over Moldavia and Wallachia.

Treaty of 1898. This treaty brought to a close the Spanish-American War. Spain evacuated Cuba, and ceded to the United States Porto Rico, Guam, and the Philippine Islands, and the United States, in token of good will, paid Spain $20,000,000.

Treaty of 1919, at Versailles. See VERSAILLES, TREATY OF.

Related Subjects. The reader is referred in these volumes to the following articles

Bonaparte, Napoleon	Seven Years' War
Crimea (war)	Spanish-American War
French and Indian Wars	Waterloo, Battle of
Revolutionary War	World War

PARIS, UNIVERSITY OF, one of the oldest and largest institutions of learning in the world. It came into prominence very early in the eleventh century, when William of Champeaux, a learned monk and teacher of theology, and his brilliant pupil Abelard began to attract attention with their lectures on theology and philosophy. Scholars from all Europe flocked to Paris, and the necessity for some sort of organization became apparent. About the middle of the eleventh century, provision of a crude sort was made for granting degrees to show progress of study. In some of the medieval schools, the organization was one of students who sought the teachers they wanted, but at Paris it was an association of teachers, or masters, out of which developed a corporation with rights and privileges. The arbitrary privilege exercised by the chancellor of Notre Dame of granting the "license to teach" was changed, and the candidate was required to deliver a trial lecture before the masters and students.

Disagreements between the students and citizens in 1229 caused many to try other universities, but Pope Gregory IX prevailed upon the masters and pupils to return, and thereby acquired quite an influence over the school. The university was divided into faculties of theology, medicine, law, and arts, and because the faculty of arts was the largest, its rector became practically the head of the university in the fourteenth century. Following quarrels with Mendicant scholars who set up schools outside the jurisdiction of the university, a series of colleges for laymen were established, most notable of which was the Sorbonne, founded in 1257. During the fourteenth and fifteenth centuries, it was the center of the educated world, and was especially noted for philosophy, which then included interpretation of the phenomena of both mind and matter. A decline followed, during which time the Jesuits and their schools were foremost in education, and the French Academy represented the scholars of France. Napoleon reorganized the university in 1808, and it was known as the Facultés de Paris until 1896, when Louis Liard gave it a new constitution. There are about 25,000 students, and nearly a third of them are from foreign countries.

The present organization includes the faculty of Protestant theology, the faculty of law, the medical faculty, which includes the Dupuytren Museum, the faculties of science and letters, and the school of pharmacy. Recently, new buildings and additional space have been allowed the university by the generosity of the city. Valuable bequests have been made by individuals to aid scientific research, etc., and the university has taken the lead in many important developments.

PARIS GREEN, a bright-green powder, prepared from arsenic acid and copper acetate. It can be used as a pigment for wall papers, but is not so used to any extent because of its very poisonous nature. Paris green is valued chiefly as a wet or dry spray to kill worms, grasshoppers, potato bugs, and other insects that feed upon the foliage of plants. It is almost insoluble in water, but is usually mixed with it for wet spraying. Such a preparation must be kept constantly stirred, else the poison sinks to the bottom, leaving the top liquid harmless, and the rest so strong as to be injurious to plants. A small amount of wet spray suitable for fruit and shade trees and shrubs would contain one-half a teaspoonful of Paris green and one teaspoonful of quicklime in a gallon of water. For potato plants, a greater amount of quicklime is needed. Dry Paris-green spray for potato plants is a mixture of Paris green, flour, and hydrated lime or plaster. See INSECTICIDES AND FUNGICIDES. T.B.J.

PARISH. See LOUISIANA (Education; Government).

PARK, MUNGO. See AFRICA (History: The Explorers).

PARK COLLEGE. See MISSOURI (Education).

PARKER, ALTON BROOKS (1852-1926), an American political leader and jurist, identified with the conservative wing of the Democratic party. He was educated at the Cortland, N. Y., Normal School and at the Albany Law School, and was admitted to the bar in Kingston, N. Y. In 1885 he became justice of the

supreme court of the state to fill an unexpired term, and was elected a year later for the full term of fourteen years. In 1898 he became chief justice of the court of appeals, an office which he resigned in 1904 to accept the Democratic nomination for the Presidency. Upon his overwhelming defeat by Theodore Roosevelt, whom he censured for "unconstitutional" methods, Judge Parker returned to the practice of law. In 1913 he was chief counsel for the plaintiffs in the impeachment of Governor Sulzer of New York. Judge Parker received honorary degrees from McGill and Toronto universities and the College of William and Mary. In 1906-1907 he was president of the American Bar Association, and in 1913-1914 of the New York Bar Association. He was also a vice-president of the League to Enforce Peace



Photo: Brown Bros.

ALTON B PARKER

PARKER, SIR GILBERT (1862-), a Canadian novelist and statesman, born at Camden East, Ont. He was educated in Trinity College, Toronto, and in 1886 went to Australia, where he became associate editor of the Sydney *Morning Herald* During the next year he made an extensive trip among the South Sea Islands and followed this cruise with a visit to Egypt, Northern Canada, India, and other lands under British control



Photo Brown Bros

GILBERT PARKER

His wide travels among British possessions made Parker an ardent believer in the closer union of the English colonies, and when he removed to London, in 1896, he immediately became active in political affairs that he might aid such a policy. He was elected to Parliament in 1900, was reëlected in 1906 and 1910, and showed much zeal in bringing about tariff reforms of such a nature that the colonies might supply the greater number of Great Britain's needs. In 1902 he was knighted by King Edward VII, in 1915 was created a baronet, and in 1916 was made a privy councillor by King George V. During the first two years of the World War, Sir Gilbert had general charge of British publicity in the United States.

His Literary Career. As early as 1888, Parker attempted literary work in an adaptation of *Faust* for the modern stage, but his genuine success began in 1892 with his stories of French-Canadian life and adventures in the northern wilds of America. The first of these, *Pierre and His People,* appeared in 1892 It was followed by a series of novels, including *Mrs. Falchion, The Trespasser, The Trail of the Sword, An Adventurer of the North, The Seats of the Mighty, The Right of Way, The Battle of the Strong, The Weavers, No Defense,* and *The Promised Land.* His *World in the Crucible* is a book on the World War

PARKER, JOHN. See REVOLUTIONARY WAR (Lexington and Concord)

PARKERSBURG, W VA. See WEST VIRGINIA (back of map).

PARKMAN, FRANCIS (1823-1893), an American writer whose chronicles are among the best of historical writings. He was born in Boston, the son of a Unitarian clergyman. Like most boys, young Francis took delight in stories of the Indians and their conflicts with the early settlers; but the subject took a deeper hold on him than on others, and while a sophomore in Harvard, he conceived the idea of writing a history of the early days of the Frenchmen in America. To get himself as much as possible into the atmosphere of the period in which he was interested, he camped and canoed, rode horseback, and practiced with the rifle until he became "an adept in woodcraft and a dead shot."

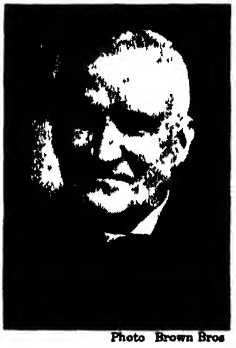


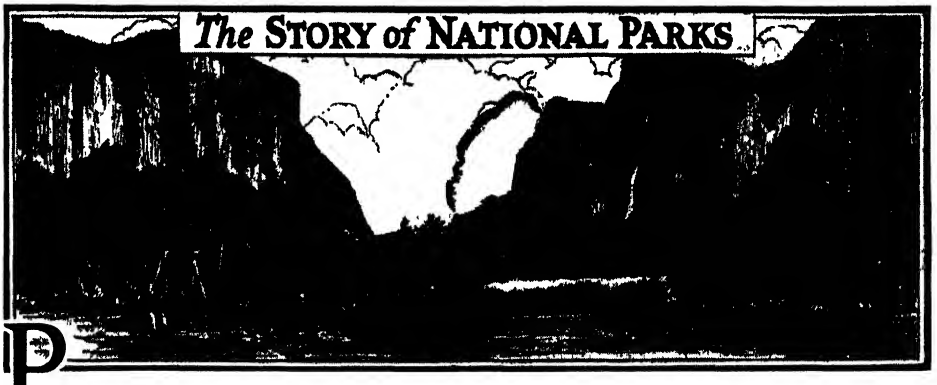
Photo Brown Bros

FRANCIS PARKMAN

After his graduation, Parkman went to live for some months with the Indians of Dakota, and the hardships he then endured injured his health permanently. He had meantime enlarged his plans to include the whole history of the struggle between France and Great Britain for domination in North America, and he began with the end, rather than the beginning, of the period, writing first *The Conspiracy of Pontiac.* During the composition of this and the other volumes that formed the complete work—*France and England in the New World,*—Parkman fought against almost insurmountable difficulties, for his health was such that on some days he could not produce more than half a dozen lines, and he was almost blind. By the aid of copyists and secretaries, however, he made a most thorough study of all the original sources for the period.

The volumes of the series, besides the one above named, are *Pioneers of France in the New World, The Jesuits in North America, La Salle and the Discovery of the Great West, The Old Régime in Canada, Count Frontenac and New France under Louis XIV, Montcalm and Wolfe,* and *A Half-Century of Conflict.* Parkman's work, based on one of the most indefatigable and thorough searches ever made, involving five visits to Europe for material, seems to leave nothing for any successor to add, while his style, without being rhetorical or ornate, is so vivid that the scenes he pictures live before his readers.

PARK RANGE. See COLORADO (Surface Features).



PARKS, NATIONAL. The giant redwoods of California; the beauty of the rocky Maine coast; the native big game of Alaska; the aloof majesty of the "great snow mountain"; that greatest of natural marvels, the Grand Canyon —all of these and other examples of unusual national scenery are being preserved for those now living and for future generations. The Federal government has saved them from gradual careless destruction or private aggrandizement, to be playgrounds of the people.

It was not until comparatively recent years, however, that a system of preservation was begun. The nation's history was long one of constant battle with the wilderness. This struggle and the very lavishness of nature's gifts caused scenic beauty to be ignored. After more than a century of progress toward urban congestion and an artificial civilization as far as possible removed from life's sources, the inevitable reaction began "Back to nature" became more than a humorous slogan The desire to turn from the artificiality of modern life to the simplicity and peace of the out-of-doors gripped all classes of people, and set them to seeking rest and quiet in the areas of natural beauty which nature lavished upon the American continent.

As far back as 1832, the government had purchased the famous medicinal Hot Springs of Arkansas, and conducted them, chiefly to make them available to the public, and to prevent selfish interests from using them for money-making schemes. In 1872 the beautiful wilderness of the Yellowstone was made a national park. Within thirty years, many other sections of the country and its possessions were brought under government protection.

In 1915 the government recognized the growing appeal of travel and outdoor recreation by creating the National Park Service of the Department of the Interior, whose duty it is to preserve the beauty of the parks, and at the same time to make them accessible to visitors. Construction of roads and trails to all places of interest, the letting of contracts for hotels and camps, and the construction of free camp-grounds are among the many activities of this service. A unified system is now established, and a park-to-park highway connects these areas in the Western states.

The national parks have become "the great summer playgrounds" of the country. More than a million and a half people find rest and relaxation each year in their cool, sheltered forests and among their lofty mountains. The common use of the automobile has brought great increases in the number of visitors. The desperate need for release from the tension of modern life has sent to the parks many who returned to their work rested and refreshed. Its very momentum has contributed to this great movement toward the out-of-doors.

To preserve the sections of great natural beauty, and to provide outdoor recreation for the people of the United States, are not the only purposes of the national parks, however. Many of them either have sections set aside for game preserves or themselves constitute vast refuges where native wild life is protected and allowed to live and multiply undisturbed. In others, prehistoric remains, or historic treasures, are preserved.

When the national-park movement was begun, all of the government lands were west of the Mississippi, while Eastern lands were



Photo Keystone

"WHAT IS SO RARE AS A DAY IN JUNE?"

There appears to be more than one answer to Lowell's query The illustration shows an inn at Rainier National Park, Washington, on a bright June day The snow averages twelve feet in depth, and some of the drifts are from forty to fifty feet deep

privately owned. It was natural, therefore, that parks were first created in the great Western wonderland, and that no preservation of the beauty or wild life of the Eastern states was attempted as a national project. Now it has been realized not only that these "playgrounds" should be placed within reach of the people east of the Mississippi, but also that the geological forms, animals, and plants peculiar to these states must be protected if they are not to perish. The movement, though it has been slow, is now attracting serious attention, and new parks are being added from time to time, as Congress authorizes their purchase.

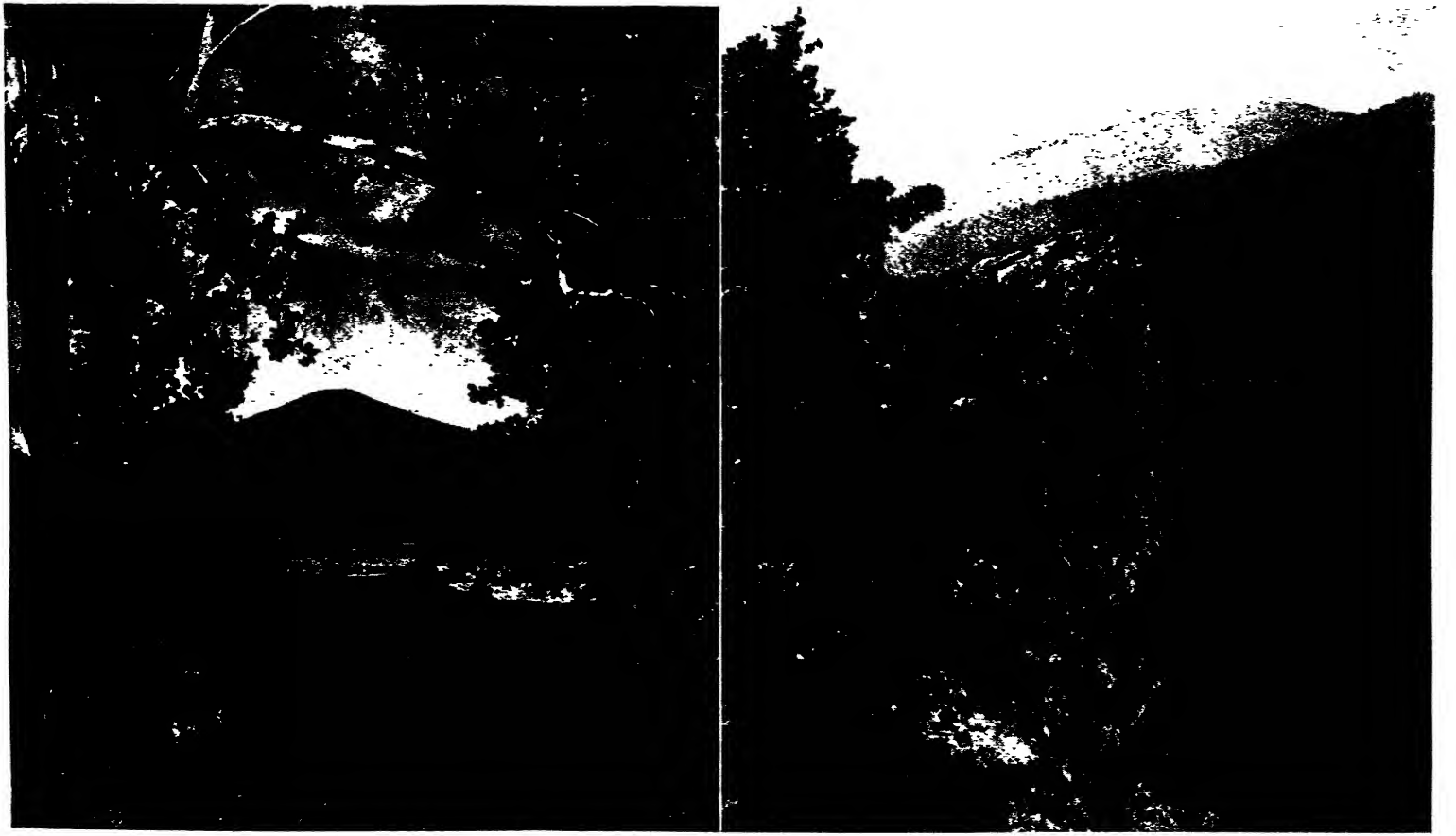
No exact distinction can be made between a national park and a national monument (see MONUMENTS, NATIONAL). A national park is created by act of Congress, with the purpose of its development into a playground for the people. A national monument is proclaimed by the President, and while it is in a sense a playground, it is set aside as a monument primarily because it has historic, prehistoric, geologic, or biologic treasures which should be preserved. Both parks and monuments are administered, with few exceptions, by the National Park Service of the Department of the Interior.

Every effort is made to render the wonders of the national parks accessible to everyone and to accommodate their visitors. These accommodations range in most places from expensive and luxurious hotels to well-kept tent camps. Autostage lines furnish transportation within the parks, and saddle horses are provided. A legion of rangers, and, in the Yellowstone Park, a detachment of cavalry, guard the forest from fire, the animals from hunters, and the wild flowers and other beauties of nature from wanton destruction by vandal tourists.

The United States government now maintains the following national parks:

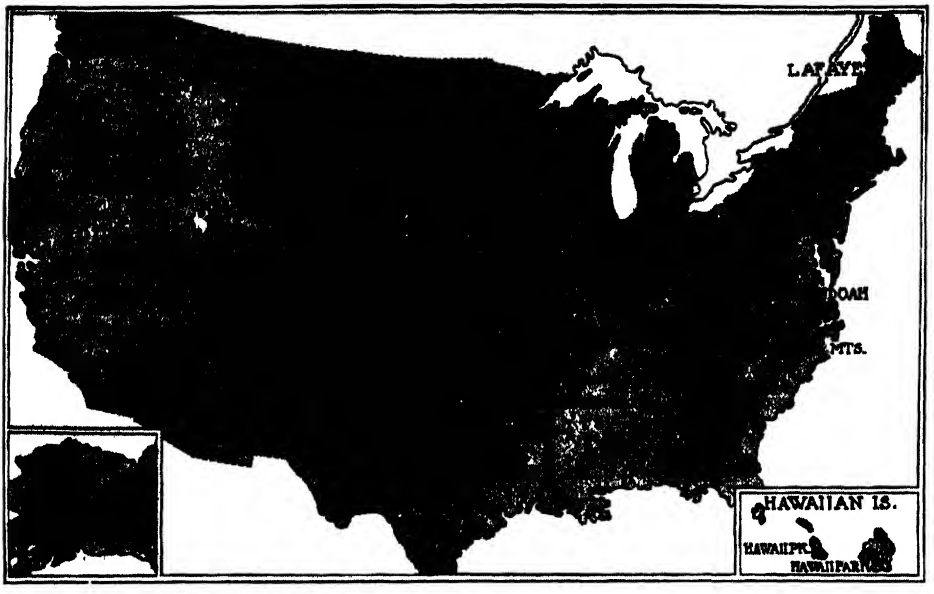
Crater Lake National Park, with its wonderfully blue lake within the walls of a volcano extinct before the human race was cradled, was created in 1902. The fretted gray lava of its thousand-foot walls, the deep green of its pines, the vivid blue of the sky, and its own blue of many shades make Crater Lake one of the most impressive of national-park wonders. The air of mystery which pervades it led Joaquin Miller to call it the "Sea of Silence." The park covers an area of 249 square miles surrounding Mount Mazama, in the Cascade range of Southern Oregon. (See illustration, article OREGON.)

General Grant National Park, a bit of California primeval forest, is really an annex to the Sequoia Park, six miles from it. It contains but four square miles, and was



Photos: Staley

In Shenandoah National Park. At left, a peak with nearly a perfect cone, seen from the Shenandoah River. At right, cliffs above Big Run.



NATIONAL PARKS OF CONTINENTAL UNITED STATES

formed in 1890 to shield the famous General Grant Tree, a sequoia 40.3 feet in diameter, and 266.6 feet in height, which was a flourishing tree before the first Egyptian pyramid was built; except for the General Sherman Tree in near-by Sequoia Park, it is possibly the world's oldest living thing.

Glacier National Park. A full description of this park will be found in the article bearing that title.

Grand Canyon. A full description of the Grand Canyon of the Colorado is contained in the article bearing that title.

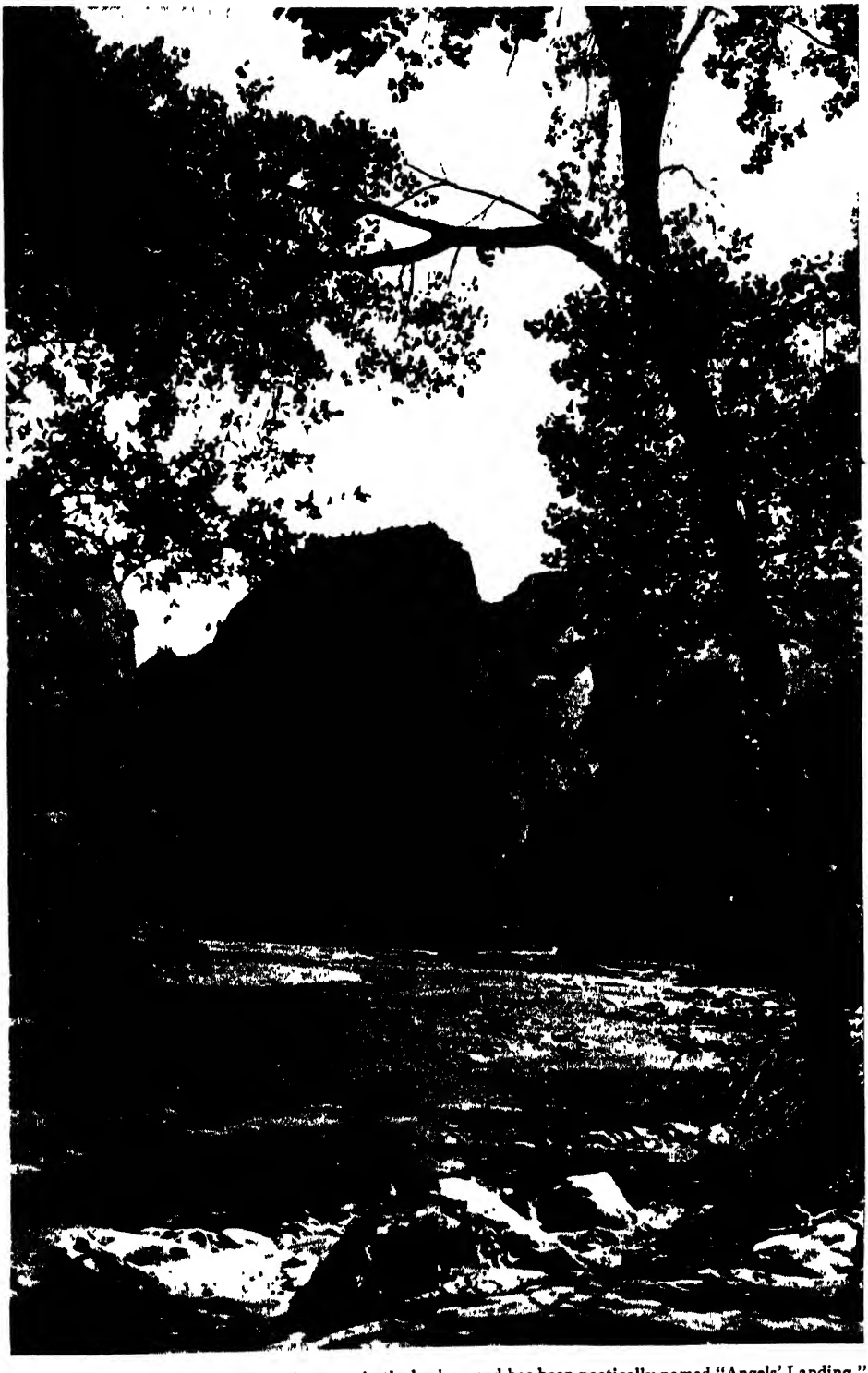
The Grand Teton National Park. This was established by act of Congress approved by President Coolidge on February 26, 1929. It embraces the most spectacular part of the Teton Mountains of Wyoming. It covers an area of approximately 150 square miles, varies from three to nine miles in width, and is twenty-seven miles in length. The north line of the park is about eleven miles south of the southern boundary of Yellowstone National Park. In addition to the sublime mountains of the Teton Range, the Grand Teton Park contains five large lakes and many smaller bodies of water, extensive forests of pine, fir, and spruce, and groves of aspen, as well as glaciers and snow fields. Much of its area is above the timber line, the Tetons rising from 3,000 to 7,000 feet above the floor of Jackson Hole, which they border on the west. The range is granite, as contrasted with the volcanic mountains of the Yellowstone.

Great Smoky Mountains National Park. This new playground was assured in 1928, when the $10,000,000 necessary for its purchase was provided by state appropriations, private gifts, and public subscription. It comprises 700 square miles of the Great Smoky Mountains area, divided equally between Tennessee and North Carolina. It will help to shelter the native plant and animal life of the Eastern mountains, which is often destroyed by private exploitation, and it is within easy reach of thousands of vacationists.

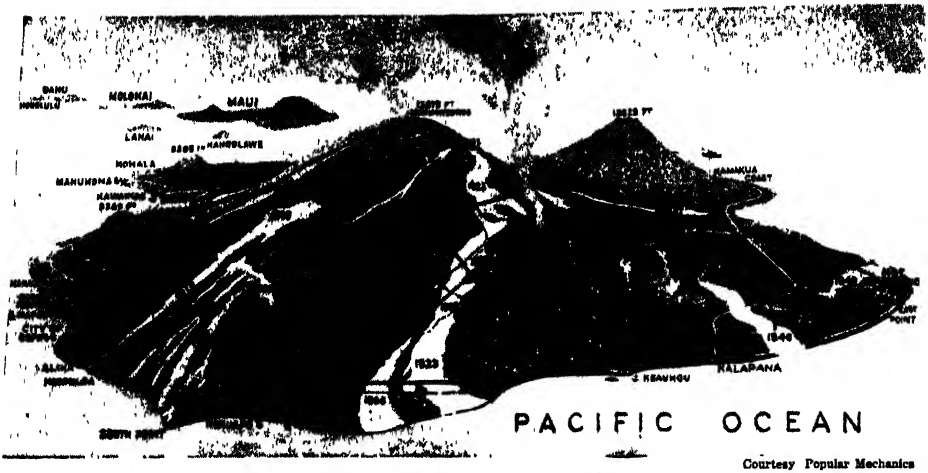
Hawaii National Park, authorized August 1, 1916, contains three volcanoes, two on the island of Hawaii and one on the island of Maui. One of the first, Kilauea, has been continuously active for a century, and many visitors are attracted to its remarkable "lava lake"; its neighbor, Mauna Loa, is the largest active volcano in the world. Both are described in their proper places in this work. The third volcano, Haleakala, whose crater, twenty miles in circumference, is the largest known, has been quiet for nearly two centuries. The area of the park is 242 square miles.

Hot Springs Reservation, in the Ozark Mountains of Arkansas, is the oldest of the national parks; it is fully described in the article HOT SPRINGS NATIONAL PARK.

Lafayette National Park, the first national park in the far eastern part of the country, comprises 20,000 acres of Mount Desert Island, off the coast of Maine. It was made a park by Congress in 1919. The area of the park was purchased by private citizens and donated to the government, and much of the development of the park has been done with gifts of private funds. The island contains the highest



In Zion National Park. The impressive mass in the background has been poetically named "Angels' Landing."



Courtesy Popular Mechanics

HAWAII NATIONAL PARK, ON THE ISLAND OF HAWAII

points of land on the Atlantic coast, where the mountains slope almost directly into the sea. See MOUNT DESERT.

Lassen Volcanic National Park, in which is Lassen Peak, the only active volcano in the United States, was created August 9, 1916. This peak, 10,460 feet high, is one of the celebrated series of peaks in the Cascade Range. Lassen Park is situated in Northern California, forty-five miles east of the Southern Pacific's line from San Francisco to Portland, and not much farther from the main line of the Western Pacific Railroad. It contains 124 square miles. Another prominent elevation is Cinder Cone, with an altitude of 6,907 feet.

Mammoth Cave. See the article MAMMOTH CAVE.

Mesa Verde National Park, if the Spanish portion of its name be translated, means the *park of the green table.* On one of the isolated table-like plateaus of Southwestern Colorado, left standing when the rains of centuries had washed away the softer earth about them, are traces of several stages of prehistoric life, from cave dwellings to carved stone temples. Cliff Palace and Spruce Tree House were the first cliff dwellings found, and they are the most celebrated. In 1915 government explorers unearthed a remarkable temple to the sun, and much yet remains to be explored. This park is not only of general interest, but of immense value to scientists, for its contributions to our knowledge of prehistoric tribes. Seventy-seven square miles of this area were reserved for a park in 1906. Mesa Verde is twenty-five miles from the Rio Grande Southern Railroad.

Mount McKinley National Park, embracing 2,645 square miles, was made a national park in 1917. Situated in south central Alaska, it is reserved as a great game refuge and breeding ground for preserving the big game of the territory, although miners and prospectors working in the park are allowed to kill game for their own food. The most prominent feature of the park is Mount McKinley, which rears its snow-capped summit 20,300 feet above the sea—the giant of the Alaskan Mountains, and the highest mountain in North America, matching the Himalayas in its grandeur. The park is attracting more visitors as its wilderness becomes accessible to travel.

Mount Rainier National Park, in which stands the tallest of the slumbering volcanoes of the Cascade Mountains, the glacier-covered Mount Rainier, is but four hours by rail and automobile from Tacoma, Wash. Nearly two miles this truncated cone rises above the surrounding country, and nearly three miles (14,408 feet) above the waters of Puget Sound. In the 325 square miles of the park there are forty-eight square miles of glaciers, from which in places emerge jets of steam and hot springs. Though not the largest, Nisqually Glacier is one of the most famous of these rivers of ice. At the base of the mountain, and often extending far up beside the glacial ice, is what John Muir has called "a perfect flower elysium," the richest subalpine garden he ever saw. The park was authorized in 1899. See RAINIER, MOUNT.

Platt National Park, in Southern Oklahoma, contains a large number of sulphur and other medicinal springs, and has an area of one and one-third square miles. This Oklahoma watering place was established in 1906, and is visited by thousands each year, who come for the beauty of the surrounding country, as well as for the benefits of curative springs. Its springs have an approximate discharge of almost 5,000,000 gallons daily. It is reached by branches of the Santa Fe and the Frisco railroad systems.

Rocky Mountain National Park, in northern Colorado, is the easiest of the big parks for



Photo: U & U

"Where Every Prospect Pleases." Timberline Ridge, in Rainier National Park. The blossoms in the foreground are those of squaw grass. Mount Adams is in the distance.



THE PARKS OF THE DOMINION OF CANADA

Eastern people to visit, for it is but a day and a half from Chicago, and only a morning's ride (fifty miles) northwest of Denver. This park possesses some of the most beautiful mountain scenery on the continent, its eastern border is 8,000 feet above the sea, and within it the Rockies tower a mile higher Longs Peak towers 14,225 feet in height. Visitors to it may cross the Continental Divide either on foot or on horseback. These 378 square miles of rugged nature were reserved by the government in 1915.

Sequoia National Park, the home of California's biggest and oldest trees, is situated in the middle eastern part of the state and contains over a million sequoias, 12,000 of which are more than ten feet in diameter and older than the Christian Era. The most famous of these is the General Sherman Tree, said to be the largest and oldest living thing in the world. It is 273.9 feet high, with a base diameter of 37.3 feet. Sequoia Park is a region of beautiful mountain scenery, of cliffs and canyons and tumbling torrents; on the eastern border of the park rises Mount Whitney, the tallest peak in the United States. The park is not far from the lines of the Santa Fe and the Southern Pacific, a little over 200 miles from either Los Angeles or San Francisco. It contains 604 square miles, set aside in 1890.

Shenandoah National Park, with the exception of the Great Smoky, the newest of the national playgrounds, extends for one hundred miles along the historic Shenandoah Valley, in the beautiful Blue Ridge Mountains of Virginia. It is in a region of great beauty, containing the famous Luray Caverns, and many historical points of interest. It is within one hundred miles of the national capital, Washington, D. C., and was created in 1927.

Sullys Hill National Park, a tract of woods and hills on the shore of Devils Lake, N. D., contains some prehistoric ruins. Its area of one and one-fifth square miles was reserved in 1904.

Wind Cave National Park, in the Black Hills of South Dakota, possesses a limestone cavern of immense size and interesting decoration, called Wind Cave because strong currents of air blow alternately in and out of its mouth. This park is becoming an important stopping-place in transcontinental travel, and attracts many visitors from the Black Hills region. It was made a national park in 1903, and includes seventeen square miles, part of which is set aside as a game preserve.

Yellowstone National Park, the largest of the parks, and the oldest and most popular of the big ones, is described elsewhere in this work. Its geysers and mud volcanoes, its beautiful canyon and waterfall, its wild animals and birds, attract thousands every year. The park contains 3,348 square miles and was authorized in 1872.

Yosemite National Park. This is described in its place in these volumes.

Zion National Park lies in southwestern Utah, near the Arizona state line, and a few miles northwest of Grand Canyon National Park. It was designated a national property in 1919, and is 120 square miles in area. In it is Zion Canyon, a great gorge from 1,500 to 2,500 feet in depth, called the "Rainbow of the Desert," because most of its stratified sandstone cliffs vary from gorgeous red near the bottom to shining white at the top. Zion is one of the most beautiful national parks.

Parks of Canada

No mountain scenery on the American continent is more inspiring than that of the four ranges of the Canadian Rockies. Here, in six national parks, the Dominion government has preserved for public playgrounds an area more than half as great as Switzerland and greater than that of all the United States parks. The eleven parks in other sections make a total of seventeen, most of which are game preserves, bird sanctuaries, or recreational areas known locally.

Three of the Canadian national parks which are world-famous, and are visited by thousands each year, are described below:

Glacier Park, well known to American tourists, covers nearly 500 square miles in British Columbia. It is famous for its ice fields, of which the best known is Illecillewaet Glacier.

Jasper Park, the largest national park in America and one of the most beautiful, comprises 4,400 square miles of magnificent mountain scenery, on the eastern slope of the Canadian Rockies. Pyramid Lake, Punch Bowl Falls, and Fiddle Creek Canyon are only three of the many beautiful and famous spots within its borders.

Rocky Mountains Park, the best-known of Canadian parks, lies directly north of the Glacier National Park in the United States. The beautiful resort region of Banff, Lake Louise, and the Valley of the Ten Peaks lie in this park and attract beauty-lovers and pleasure-seekers from all over the world See BANFF; LOUISE, LAKE.

PARLEMENT, the name applied in France, down to the French Revolution, to certain final courts for the administration of justice, in which the edicts of kings also were registered before they became laws Their historical importance lies in their influence upon later judiciary tribunals in France and throughout the world. They did much to summarize and unify the common law, and in dispensing justice were notably free from prejudice and party influence. Although there were at least twelve provincial parlements in leading cities, the most important was the Parlement of Paris, which dated from the fourteenth century.

Although they were not directly connected with that of Paris, the provincial parlements made common cause with it in its struggles with the royal power. The functions of the parlements were chiefly judicial, although they had wide political and administrative power. They were especially influential in the reigns of Louis XI and Louis XIV. Louis XV abolished the Parlement of Paris, and constituted a new and somewhat different body, but the former counselors were recalled by Louis XVI. The Parlement of Paris and all the local parlements were abolished by the National Assembly in 1790; for although these bodies had been in the years before the Revolution ardent advocates of reform, they were as unwilling as the nobles and the clergy to give up any of their own time-honored privileges. See FRANCE (History).



The STORY of PARLIAMENT

PARLIAMENT, in general, any deliberative assembly; but specifically, the supreme legislative body of the United Kingdom of Great Britain and Ireland. This term is also applied to the Federal legislative bodies of Canada, the Union of South Africa, and the Commonwealth of Australia. Among all peoples in a tribal state of society there was always a tribal council that advised with the tribal chief; when the tribes united to form a confederacy, there was always a council representing it to advise with the king. This was true of the confederated tribes of the Anglo-Saxons that overran England. The modern Parliament of the United Kingdom is the development of these primitive councils.

In early times there were three divisions of the lawmaking power in England—the king, the lords, and the commons. In the long course of transition to the present Parliament there occurred a complete reversal of the relative power and importance of these constituent parts. Anciently, the king was the source of legislative enactments; he was advised, however, by his lords. Only by slow degrees were the common people, by means of their representatives, admitted to a share in the councils of state. The first assembly comparable to the modern Parliament met in 1295. Not until the reign of Edward III was Parliament formally divided into two houses, the House of Commons and the House of Lords. Then began a long struggle, which was ended by the House of Commons becoming the most important lawmaking power in Great Britain; the House of Lords still existed, but was shorn of much of its ancient prestige, while the sovereign lost all power to interfere in legislation. This result followed the passage of the Bill of Rights in 1689. The saying has become proverbial, "The king reigns, but does not rule." Though he has the constitutional right to be present

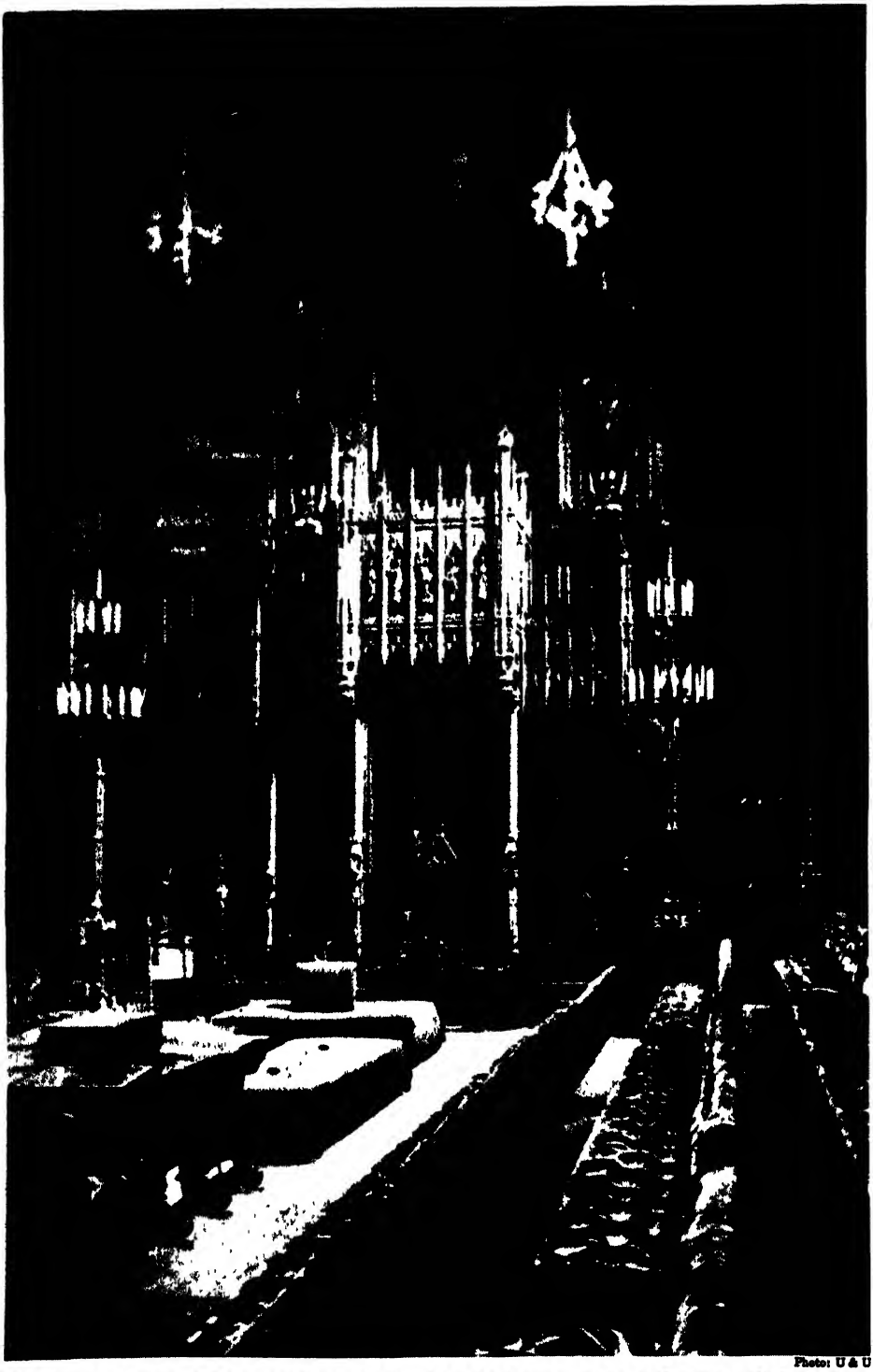


Photo: U & U

The House of Lords. This body ranks next in dignity to the Crown. As in the Commons, the lords sit on benches facing the center aisle.

5392



From the painting by Reid

Parliament of Henry VI. The king is seated on a canopied throne. The lawmakers of the period were a select group. Standing near the king are the archbishop of Canterbury and nobles. Bishops are at the left, the lords on the right, and the judges are in the center. This is a rare picture. 5393



Photo Visual Education Service

THE HOUSE OF COMMONS

The members occupy benches facing the center of the House. The Speaker's chair is in the background in the illustration.

in the House of Lords, not, however, taking part in the debate, it has been more than two centuries since this right was exercised.

The House of Commons. This body as now constituted consists of 615 members—492 from England, 36 from Wales, 74 from Scotland, and 13 from Ireland. It is the real governing body of the nation; and, owing to the extension of male and female suffrage, it is truly representative of the common people. It has full control of all financial legislation, the House of Lords having lost the power of amending any financial measure sent up to it by the House of Commons, although it formerly had the right of rejection. The House of Commons shapes the policies of the nation by reason of its control over the Cabinet Ministers. Before the reign of Queen Anne (1702-1714) the Ministers were in name, and in fact, the servants of the sovereign; but since then they have been the servants of the House of Commons. As such they must resign when they lose the support of the Commons, which fact is evidenced by the defeat of any important measure they support. See CABINET (The British Cabinet).

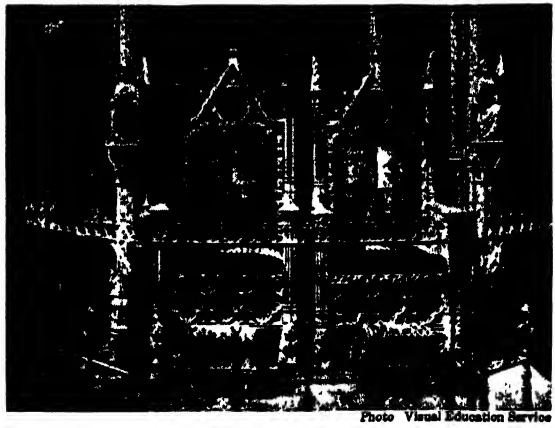


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THE THRONES IN THE HOUSE OF LORDS

The House of Commons is an elected body; about half the members represent counties, a large number represent boroughs, and nine represent universities. Those eligible to vote for members representing the universities are their graduates. Not every citizen is qualified to be elected to the Commons. All clergymen of the Church of England, or the Church of Scotland, or of the Roman Catholic Church, and all sheriffs, and returning officers for the territory for which they act, are debarred from being candidates.

There is this peculiarity about the English elective system: a candidate does not have to be

a resident of the district he seeks to represent. He may live in one part of England and be elected by a district in another part; if defeated for election in one place, he may try for election elsewhere. If elected, he represents his district for the life of the Parliament to which he is elected, which is five years, unless it is dissolved before that length of time. Parliament usually sits from January to August or September; members formerly served without pay, but since 1911 they have received a salary of £400 each, unless already in receipt of remuneration from another public source.

The House of Lords. This is the upper house of the English Parliament, and consists now of about 740 members, composed of the spiritual lords of England (the archbishops and some of the bishops) and the temporal peers of the United Kingdom, together with representative peers of Scotland and Ireland. All peers of the United Kingdom are entitled to seats in the House of Lords, but of the Scottish and Irish peers only a small number are chosen by their fellow-peers to represent them in Parliament. There are sixteen Scottish and twenty-eight Irish representative peers, each elected for life. The remainder of the Lords in the House belong to the peerage of the United Kingdom. See PEER.

Formerly, the House of Lords was the more important of the two houses; it existed, in fact, before the House of Commons, but its importance gradually waned as the Commons steadily increased in power and influence. The Lords have now lost the power to defeat the will of the people as expressed in legislative enactments of the Commons, though they can delay the application of legislation two years. In accordance with the Parliament Act of 1911, a bill passed by the House of Commons in each of three successive sessions of Parliament, although rejected by the House of Lords, becomes a law without the sanction of that chamber. This loss of power was not accepted by the Lords without a protest, and they did not yield until the king made it clear that he would create enough Liberal peers to place the opposition in the minority. It is the king's right to create any number of new peers at pleasure.

Parliaments in British Dominions. Four of the self-governing British units—Canada, Australia, New Zealand, and South Africa—have legislative bodies whose powers and organization correspond to those of the British Parliament. In New Zealand the legislature is called the General Assembly, but in the other Dominions it is known officially as the Parliament. The upper house is called the Senate in Canada, Australia, and South Africa, and Legislative Council in New Zealand. The lower house is called the House of Commons in Canada, the House of Representatives in Australia and New Zealand, and House of Assembly in South Africa. For further details, see *Government*, in the articles in these volumes, on AUSTRALIA; CANADA; NEW ZEALAND; SOUTH AFRICA, UNION OF.

E.D.F.

Related Subjects. A discussion of the legislative bodies of other countries will be found in these volumes in the following articles.

Barebones Parliament	Long Parliament
Congress, United States	Reichstag
Diet	Rump Parliament
Duma	

PARLIAMENTARY LAW, the system of rules by which deliberative bodies are organized and their proceedings are conducted. Organizations are found in every hamlet; many rural school districts have their debating societies; churches, lodges, and other bodies are banded together in such a way that at least all meetings for business purposes need to be conducted in a systematic manner. Everyone, therefore, should be acquainted with the fundamental principles of parliamentary law, and be able to apply them in organizing and conducting any society of which he may be a member.

The principles are universal in their application, but each organization should have a set of rules by which it is guided in the transaction of its business. These rules form its constitution and by-laws.

Organizing a Society. The first step in organizing a society of any sort is to secure the attendance of those interested in the project at a meeting called to effect the organization. Someone should call the meeting to order, when a temporary chairman should be elected. Following the election of the chairman, a secretary should be chosen. Such measures may then be taken toward completing the organization as those assembled decide upon. The usual method of procedure is to appoint a committee to prepare a constitution and by-laws to be presented later for adoption. When these are adopted and the officers provided for have been elected, the society is permanently organized.

Officers. Every organization, no matter what its purpose, must have a president, a secretary, and a treasurer. Most societies have a vice-president to preside in the absence of the president. In small organizations, the officers of secretary and treasurer may be combined in one person, if such a combination appears desirable.

The President. It is the duty of the president to preside at all meetings and see that they are conducted in accordance with the constitution and the principles of parliamentary law. He should conduct the business in the order prescribed in the by-laws of the society, entertain all motions, decide all questions of order, state a motion to the society when it is ready to vote upon it, and declare the result of the vote. He is also required to perform such other duties as the constitution may provide,

such as appointing committees and looking after the general welfare of the society.

The vice-president performs the duties of the president in his absence.

The Secretary. The secretary's duties consist in keeping a record of each meeting of the society, and in being custodian of all its records and other papers.

The Treasurer. The treasurer is required to receive all money due the society, to be responsible for its safe-keeping, and to disburse it as the society may direct. At stated times the treasurer should render a written report, showing how much money he has received, and from what sources, and how much he has paid out, and the purposes for which it has been paid.

Conducting a Meeting. After the society is called to order, the secretary's report of the last meeting should be read and approved. Then the order of business set forth in the by-laws should be followed. It is the president's duty to take up each item in this order and see that it is disposed of. If there are any items not requiring attention at that particular meeting, he passes on to the next until he has gone through the entire list. When the last item has been disposed of, the society adjourns.

The usual order of business, in absence of any rule to the contrary, is as follows:

(a) Reading minutes of last meeting and their approval.
(b) Reports of standing (or regular) committees.
(c) Reports of special committees
(d) Unfinished business (not fully disposed of at last meeting).
(e) New business.

Motions. All business is introduced by *motions.* A member desiring to bring any matter before the society should rise and address the chair as "Mr. President," or "Madam President." The president then recognizes the member by calling his name, and he "has the floor." He then makes his motion and is seated. Before the motion can be acted upon, it must be *seconded,* and this can be done by any member without leaving his seat or addressing the chair. After the motion is seconded, the president restates it to the society, and it is "before the house" for action. Debate is then in order; if there is no debate, the motion is voted upon at once. If the debate continues too long, any member may bring it to an end by the call of "Question."

Classes of Motions. A motion made for the purpose of securing action on any matter constitutes the *main question,* or the *principal motion,* and any other motions made for the purpose of modifying the principal motion are known as *subsidiary motions.* The most common form of the subsidiary motion is the *amendment.* For instance, A moves that the secretary be instructed to purchase a book in which to keep the records of the society, the cost not to exceed three dollars. B moves to amend the original motion by limiting the cost to two dollars. C moves to amend the amendment by limiting the cost to one dollar and fifty cents.

Here we have two subsidiary motions. How is the president to dispose of them? The answer is very simple. He must have the society vote on them in the reverse order in which they were made. First, the amendment to the amendment is voted on, then the amendment as amended. If both amendments fail, the final vote is on the original motion; if the amendments carry, the final vote is on the original question as amended.

Only one principal motion, or main question, can be before the house at one time. Had B moved that the society proceed to secure a lecturer before A's motion and its second had been disposed of, he would have been out of order, and the president would have refused to put his motion.

Privileged Questions. As a rule, when a question is before the house, it has the right of way. Debate upon it cannot be stopped, nor can any other main question cause it to be set aside. Certain questions, however, take precedence over the main question:

To adjourn
To lay the question on the table
To take a recess
Questions of privilege
The previous question

When any of the foregoing motions is made, action on the main question must be set aside until the disposal of the subsidiary question. None of these five questions or motions is debatable. The previous question means that debate be closed and vote on the main question be taken, and it requires a two-thirds vote to be carried.

A motion to adjourn is not debatable. A motion to adjourn to a definite time or to the call of the chair is debatable. A motion to adjourn cannot be made while a speaker has the floor, but it may be made while action on the main question is pending.

Points of Order. Whenever a member wishes to call another member to order, he rises and says, "Mr. President, I rise to a point of order." He then states his point. The president then decides whether or not the point is sustained. The chief violations of points of order consist in making motions when a principal motion is before the house, using unparliamentary language in debate, or talking upon subjects not pertinent. E.D.F.

PARMA, *pahr' mah.* See ITALY (The Cities).

PARNASSUS, *pahr nas' us,* a mountain so intimately connected with the worship of

certain deities of the ancient Greeks that its name is still a synonym of all that relates to poetry and the cultivation of the fine arts. Lowell, in his *Fable for Critics*, speaks of his own poetic ventures in the words—

There is Lowell, who's striving Parnassus to climb
With a whole bale of isms tied together with rhyme.

Parnassus is a picturesque mountain in Southern Phocis, with twin peaks which reach a height of over 8,000 feet. Except in the hottest months, snow crowns the summit. One of the most sacred of all Grecian mountains, it was looked upon anciently as the special haunt of Apollo, the Muses, Dionysus, and Pan. Those frenzied devotees of the wine god, the Bacchantes, held their orgies annually on one of the two peaks, and in the groves at all times sounded the pipes of Pan. There were two especially holy spots, however. One of these was the fountain of Castalia, a spring which still bubbles, pure and delightful, out of the cleft between the two great peaks. This water was supposed to give to all who drank of it true poetic inspiration. The other sacred spot, on the southern slope, was the famous Delphic oracle of Apollo, which played so large a part, not merely in the mythology, but in the history of Greece. The modern name of the mountain is Likeri.

PARNELL, CHARLES STEWART (1846-1891), an Irish statesman who was one of the foremost figures in the Irish opposition to English rule. He was born at Avondale, Ireland, his mother being the daughter of Rear Admiral Stewart of the United States navy. In 1875 he entered Parliament for Meath, and soon had attained a commanding position, which he continued to hold almost until his death. His program from the first included a National Parliament and Home Rule for Ireland.



Photo Brown Bros

CHARLES STEWART PARNELL

In the interests of the Land League, whose object was to improve the condition of the poor tenants, Parnell visited America in 1879 and collected a large popular subscription. After 1880 he was the formal as well as the actual head of the Irish party in Parliament, and his agitation on the land question was so persistent that in 1881 he was arrested and imprisoned for six months. When Gladstone became head of the Ministry, in 1886, on a Home Rule platform, Parnell supported him, but the party was speedily defeated and went out of office. In the next year, Parnell and his associates were accused by the *London Times* of conspiracy against the government, and facsimile letters were published to prove their guilt. Parnell protested in Parliament that the letters were forgeries, and the finding by a commission that such was indeed the case made Parnell more powerful than he had ever been before.

Meanwhile, rumors had become current connecting Parnell's name with that of Mrs. O'Shea, the wife of one of his supporters, and in 1889 Captain O'Shea began divorce proceedings, naming Parnell. No defense was offered, the divorce was granted, and Parnell and Mrs. O'Shea were married; but Parnell's reputation and influence were so shattered that he was deposed as leader of the Irish party. He attempted to organize an independent Nationalist party, but without success. The struggles and contentions of his stormy career had undermined his health, and he died on October 6, 1891, less than a year after his loss of the leadership of the Irish party. See HOME RULE; IRELAND.

PAROCHIAL, *pah ro' kih al*, **SCHOOLS.** See SCHOOL (Special Schools).

PARODY, a comic imitation of any serious writing. The subject need not be the same—indeed, should not; but the manner and form must suggest the original work. Parodies on verse are more common than those on prose, though Washington Irving's *Knickerbocker's History* was originally intended as a parody, and Bret Harte mimicked the style of various authors in his *Condensed Novels*.

Parody is very old, for the first-known example, the *Battle of the Frogs and Mice*, dates from at least the fifth century B.C. The *Acharnians* of Aristophanes was a parody on Euripides; *Don Quixote* was neither more nor less than a parody on the exaggerated romances of chivalry; and the nineteenth century was particularly rich in such burlesques. Browning, Rossetti, Wordsworth, and Whitman by their mannerisms especially lend themselves to being parodied, and some of the imitations are remarkably clever and striking. One of the most popular parodies of recent years is by a minor poet, Ben King—*If I Should Die To-Night*. It follows:

If I should die to-night
And you should come to my cold corpse and say,
Weeping and heartsick o'er my lifeless clay—
If I should die to-night, and you should come in
deepest grief and woe—
And say, "Here's that ten dollars that I owe,"
I might arise in my large, white cravat, and say,
"What's that?"

If I should die to-night and you should come to my
cold corpse and kneel,
Clasping my bier to show the grief you feel—

I say, if I should die to-night and you should come
to me and there and then
Just even hint 'bout payin' me that ten,
I might arise the while, but I'd drop dead again.

PAROLE, *pa rohl'*, a term employed in a legal sense to distinguish verbal agreements, or those not written under seal, from written contracts. In criminal law it refers to the release of a convicted criminal upon his word of honor. When a convict is paroled, he is entrusted to the oversight of some reputable citizen, to whom he must report regularly.

In a military sense, parole refers to the pledge of honor given by a prisoner of war, that if released he will not take up arms against his captors or their allies, during a certain period. If freed by exchange, he is released from this pledge. Although a breach of the pledge is punished by death in case of recapture, the soldier's agreement is evidently not thought sufficient surety, for paroles are seldom granted among prisoners of war.

The term also applies to the military watchword, or countersign, used to obtain an accurate identification of persons. In the forty-fourth Article of War of the United States army, it is stated that—

Any person belonging to the armies of the United States who makes known the watchword to any person not entitled to receive it according to the rules and discipline of war, or presumes to give a parole or watchword different from that which he received, shall suffer death or such punishment as a court-martial shall direct.

Derivation. The word *parole* is traced to the Latin *parabola*, meaning *speech*, or *parable*; it is the shortened form of the French phrase *parole d'honneur*, or *word of honor*.

PAROQUET. See PARRAKEET.

PAROTID, *pah rot' id*, GLANDS. See SALIVA.

PARR, CATHARINE. See HENRY (VIII, England).

PARRAKEET, *pair' a keet*, OR **PAROQUET,** *pair' o ket*, a division of the parrot family in



Photo Visual Education Service

THE PARRAKEET

which the birds are distinguished by their small size and their long, graduated tails. Parrakeets are found in Northern Africa and in India, Malaysia, and Australia. The best-known Indian species is the *rose-ringed parrakeet*, which is about sixteen inches in length, ten inches being the measure of the tail. A small parrakeet that sleeps hanging to the branch of a tree is called the *bat parrot*.

The *ground parrakeet* of Australia and Tasmania lives among thickets, rather than in trees. A species of African parrakeets that makes a great show of affection is called the *love bird*. The beautiful, green and orange *Carolina parrakeet*, the only species found in the United States, was once a familiar summer visitor in the central part of the continent, but it has been almost exterminated. If this bird still exists in the wild, it is found only in the dense swamps of Central Florida and along the lower valley of the Mississippi River. D.L.

Scientific Name. Parrakeets belong to the family *Psittacidae*. The Carolina parrakeet is *Conuropsis carolinensis*

PARRHASIUS, *pa ra' shih us*, a famous Greek painter who lived in the time of Socrates (about 400 B.C.). He was born in Ephesus, but became a citizen of Athens. The character of his work is known only from the criticism of ancient writers, as none of his paintings has survived. Pliny states that he was the first artist who made the proportions of his pictures correct, and that he excelled in drawing the outlines of objects. He is said to have been the first who knew how to give the effect of solidity by the use of light and shade. Most of his paintings were on mythological subjects; his picture of Theseus was placed in the Capitol of Rome.

An interesting story is told of his contest with a rival, Zeuxis. The latter displayed his picture of grape clusters, painted so truly that the birds tried to eat them; he then asked Parrhasius to draw aside the curtain hanging before his own picture. Whereupon Parrhasius claimed the victory, for the curtain was the picture itself, and it was a greater feat to deceive an artist than to deceive the birds.



MAXFIELD PARRISH

PARRISH, *pair'-ish*, MAXFIELD (1870-), a noted American illustrator whose pictures are distinguished for their poetic design, rich coloring, delicate humor, clever gradations of tone, and detail of background. He was born in Philadelphia. After his gradu-

ation from Haverford College, he studied at the Pennsylvania Academy of Fine Arts, in Philadelphia, and was also a pupil of Howard Pyle. In 1897 his design won a prize offered by the *Century Magazine* for a poster to be used as a cover, and since then his exquisite poetic drawings have appeared regularly on the covers of many of the foremost periodicals.

Although best known as an illustrator, Parrish shows ability in decoration, as is evidenced by his mural decorations of "Old King Cole" on the walls of the grill room at the Mask and Wig Club of Philadelphia. Among the notable works for which he has furnished illustrations are Mrs. Wharton's *Italian Gardens*, *Arabian Nights*, *Mother Goose in Prose*, Irving's *Knickerbocker's History of New York*, and Eugene Field's *Poems of Childhood*. *The Sandman* and *The Bulletin Board* are two of his best-known paintings.



Photo P & A

RANDALL PARRISH

PARRISH, RANDALL (1858-1923), an American writer of romances and tales of adventure. He was born in Henry County, Ill., and educated at the University of Iowa. After practicing law for several years at Wichita, Kan., he prospected during 1883-1885 in Arizona and New Mexico; later, he engaged in newspaper work in Denver, Omaha, Sioux City, and Chicago

His Stories. In 1904 Parrish began his career as a popular story-writer with the successful novel *When Wilderness Was King* The long list of its successors includes *My Lady of the North*, *A Sword of the Old Frontier*, *Bob Hampton of Placer*, *Beth Norvell*, *Prisoners of Chance*, *Last Voyage of Donna Isabel*, *My Lady of the South*, *Don MacGrath*, *My Lady of Doubt*, *The Air Pilot*, *The Red Mist*, *Beyond the Frontier*, *Contraband*, *Mystery of the Silver Dagger*, and *Gift of the Desert*

PARROT. Because it can be taught to speak words and phrases by imitating the sounds it hears, the parrot is one of our most popular cage birds. Brilliant plumage, a stout, hooked bill, a fleshy tongue, and feet adapted to climbing are other familiar characteristics of the bird. The order contains about 625 species, distributed throughout all tropical countries, but most abundantly in Central and South America, Australia, and the Pacific islands. Parrots are sociable birds, usually living in flocks. Their voices are loud and harsh, and are used constantly and vigorously. They eat a variety of food, including seeds, nuts, insects, nectar, and, in some cases, carrion. Most species nest in holes in trees, but deposit their eggs in banks of earth. Two or three white eggs are laid. The average length of life of the parrot is sixty years.

Among American parrots are the splendid *macaws* and many smaller species, only two of which, however, are found north of Mexico.



AFRICAN GRAY PARROT

In New Zealand are found the *brown parrot*, also called the *kaka parrot*, in imitation of its voice; the *kea*, or *mountain parrot*, a large species, infamous for its sheep-killing habits; and the *owl parrot*, an odd species whose name refers to the hairlike feathers about its eyes and its reputation as a night prowler. In the Australian region are found the *cockatoos*, very large birds, usually white in color, tinged with rose or sulphur-yellow, and having large frontal crests; and the *lories* and *lorikeets*, small, handsome birds with pointed wings and rounded tails. African parrots are small, usually less than twelve inches in length. The best-known African species is the *gray parrot*, one of the cleverest talking birds. *Pygmy parrots*, from three to five inches long, are found in the Papuan Islands. The true *parrakeets* form a numerous group, of wide distribution. See PARRAKEET; LORY.

The Parrot in Captivity. The parrot seen most commonly in homes is a native of Cuba.



Photo, U & U

AN INTERESTING MOVING PICTURE

This parrot has forsaken the traditional cracker and is lunching on rarer viands And it is safe to assume he does not talk with his mouth full.

Thousands of this species are brought into the United States and Canada annually. The Cuban parrot is about ten inches long, and has a green body, white forehead, scarlet throat, and brilliant wings and tail feathers, which display a gorgeous mingling of blue, green, and scarlet. There are people who make it their business to train the birds to be household pets.

They should have warmth, cleanliness, pure, wholesome food, and fresh air, if they are to remain healthy in captivity. Soft, moist food, such as corn-meal mush, bread and milk, or toast soaked in coffee, is best for the young birds, while the older ones thrive on sunflower seed, hemp, unhulled rice, cracked corn, pilot crackers, nuts, mellow apples and bananas, and raw or cooked vegetables. Cuttlefish shell, crushed oyster shell, and pulverized charcoal are excellent aids to digestion, and ground cayenne pepper serves admirably as a relish. The birds should not be given water freely until they have become accustomed to their new climate.



YELLOW-HEADED PARROT

Patience and perseverance are required in trying to teach a parrot to talk. The words should be repeated distinctly, with the same pronunciation and accent each time. The bird may attempt something entirely different from what you are trying to teach him, but do not become impatient. If an intelligent bird, he will soon acquire an interesting vocabulary, and you will be astonished to find how much he knows.

Some people provide only a perch for their parrot, and allow him to fly about. Any cage used should be large enough to give the bird plenty of room for exercise, and in addition, he should be let out frequently, for there is little danger of his being hurt by other bird or animal. A bath is not necessary every day, though the parrot does enjoy it. D.L.

Psittacosis, *sit a kó sis,* or PARROT FEVER, a disease contracted by human beings in close contact with parrots Until 1929 it was quite rare in America, but in that year was spread through importation of affected parrots Victims show symptoms of pneumonia, they suffer from high fever. About 35 per cent of the cases result in death.

Scientific Name. Naturalists are not agreed as to the detailed classification of parrots, but these birds by general agreement are placed in the suborder *Psittaci* of the order *Psittaciformes.* Typical parrots constitute the family *Psittacidae.* Some authorities place the cockatoos and some other groups in separate families, and others classify them as subfamilies under *Psittacidae.*

PARRY, *pair' ie,* SIR WILLIAM EDWARD (1790-1855), a British Arctic explorer and naval officer. His explorations established for England the "highest north" record for a period of forty-eight years. Born at Bath, he entered the British navy as midshipman in 1806. His career as an Arctic explorer began in 1811 as lieutenant in the frigate *Alexandria.* Subsequently, he made three expeditions in search of the Northwest Passage. Although these were unsuccessful in their immediate objective, they resulted in important dis-

coveries, including the discovery of Melville Island (which see). In 1827 Parry sailed on the *Hecla* in an attempt to reach the North Pole by the Spitsbergen route. Leaving his ship in Trurenberg Bay, he started for the far north with two boats, twenty-eight men, and supplies for about seventy days. The boats were fitted with steel runners to serve as sledges. In the hazardous journey across the ice, he reached a point in latitude 82° 45′, the highest north thus far attained. Parry described the experiences of his Polar journeys in two books, *Voyages for the Northwest Passage* and *Narrative of an Attempt to Reach the North Pole in Boats.*

He was knighted in 1829 and also given the degree of D.C.L. by Oxford University. He retired from the navy in 1852, with the rank of rear admiral. At the time of his death, he was deputy governor of Greenwich Hospital. See NORTHWEST PASSAGE.

PARSEC, *pahr′ sek.* See ASTRONOMY (Distances That Defy the Imagination).

PARSEES, *pahr′ seez,* a religious sect of India which takes its name from Pars, or Fars, a province in Persia, where it was founded. The Parsees are the modern followers of Zoroaster (see ZOROASTER; ZEND-AVESTA). They have great veneration for fire, regarding it as the emblem of purity and good. The invasion of the Mohammedans in the seventh century drove the greater number to the western coast of India, where they have advanced and prospered, but their worship has accommodated itself to Hindu ideas and practices. Bombay is their headquarters. The small number that remained in Persia were subjected to persecution and sank into poverty. They preserved their religion intact, however, and to-day they are respected by Europeans for their honesty and integrity. The Parsees do not marry persons not of their caste or creed, nor do they eat anything prepared by one of another religion. "Thou shalt not defile the earth" was one of the teachings of Zoroaster. Therefore his Parsee followers laid none of their dead in Mother Earth to taint her with their corruption. Among the curious customs of the Parsees was the disposal of their dead in towers of silence, a practice almost abandoned through British influence.

Towers of Silence. See article in these volumes, under that title.

PARSIFAL, *pahr′ sih fahl,* a religious music drama by Richard Wagner, the story of which is founded upon the legend of the Holy Grail (see HOLY GRAIL). Wagner adopted, with some changes, the version of the legend found in the *Parsival* of Wolfram von Eschenbach, one of the greatest poets of medieval Germany. *Parsifal* was presented for the first time at Bayreuth, Germany, in 1882, its production elsewhere having been forbidden until the expiration of the copyright. On Christmas Eve, 1903, it was produced at the Metropolitan Opera House of New York, for the first time outside of Bayreuth; since then, several renditions have been given by the leading opera organizations of America. Its presentation requires several hours, and it is customary to divide the performance into two sections, with an intermission of from one to two hours. This masterpiece contains some of the most inspiring music and most beautiful scenic pictures of any of the great composer's works.

The Story. The scene of the drama is in or near the Castle of Monsalvat, Spain, also known as the Castle of the Holy Grail Parsifal is a young and inexperienced knight who is brought to the castle by another knight to witness the adoration of the Holy Grail. Unable to understand its sacred character, he is cast out by the other knights. Another important character is Amfortas, formerly a knight of the Holy Grail and keeper of the Holy Spear. Amfortas has fallen into the power of a magician, Klingsor, who has wrested the Spear from him and wounded him with it in the struggle. The magician uses a beautiful woman, Kundry, to tempt the knights to break their holy vows, but neither she nor Klingsor succeeds in leading Parsifal astray.

This young knight not only resists temptation, but recovers the Holy Spear from Klingsor. He then begins a search for the Castle of the Holy Grail When many years have passed, he meets another knight in company with Kundry, who has repented After baptizing her, Parsifal is led to the castle by the knight, where he heals the wound of Amfortas by touching it with the Spear, and where he is proclaimed king of the knights of the Holy Grail.

PARSING, *pahr′ sing.* In the days when every schoolboy studied Latin grammar, schoolmasters would call for the part of speech of any word by asking "Pars?"—this being the Latin equivalent of *part.* Thus it has come that we are said to *parse* a word in English grammar when we tell the part of speech to which it belongs, and explain how it is used in the sentence. Parsing has declined as an exercise until it is rarely used in the study of grammar. There is little value, particularly for school children, in the mechanical recitation of formal parsing. It is not to be confused with analysis, which is often necessary to determine the proper form of a word for a particular statement.

The information which should be stated when parsing each of the parts of speech is given below:

Noun: State classification, person, number, gender, and case, and its syntax, or use, in the sentence.

Pronoun: State classification; its antecedent, expressed or understood; its person, number, gender, and case, and its use in the sentence

Adjective: State classification, degree of comparison, and its use in the sentence.

Adverb: State classification, degree of comparison, and use in the sentence.

Verb: State classification, regular or irregular, transitive or intransitive; its voice, if transitive; its

object, if it is in the active voice; its mode, tense, person, and number, and the subject with which it agrees.

Preposition: Name its object and point out the word modified by the phrase it introduces.

Conjunction: State what elements of a given sentence it connects, and thus determine whether it is coördinate or subordinate.

Interjection: It is only necessary to point out interjections, because they have no grammatical relation to the rest of the sentence

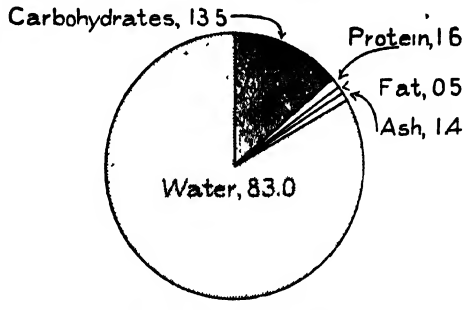
PARSLEY, a biennial garden herb cultivated chiefly for its leaves, which have a pleasing flavor that makes them popular as a garnish or as a seasoning. If permitted to grow to maturity, the plant will reach a height of three feet and bear small, greenish-yellow flowers. Most cultivated varieties do not develop the flower stalk promptly, and in the rosette stage, the leaves are of bitter flavor. Several kinds of parsley are grown in gardens, the favorite variety being the one with curled leaves. The seed, which germinates very slowly, should be sown as soon as the ground can be worked. Seed should be covered with half an inch of dirt, pressed down compactly. The growing plants should be thinned until they are about six inches apart in the rows, and should be kept free of weeds. If leaves are desired for garnishing through the winter, plants may be transplanted to window boxes. Some housewives put parsley leaves in paper bags, hang them away to dry, and use them later with other herbs in soups.

This fragrant herb was well known to the ancients. In the stories of Hercules, its leaves are mentioned as forming one of his garlands of victory, and the Greeks used parsley wreaths both on festive occasions and at their funerals. Because the plant was so slow in coming up, they had a common saying that the seed had to go to Hades before the young shoot could appear above ground. There is an old English proverb of like import—"Parsley seed goes to the Devil and back again nine times before it comes up." B.M.D.

Scientific Name. Parsley is the common name of the family *Umbelliferae* (which see). The botanical name of garden parsley is *Petroselinum sativum.*

PARSNIP, a familiar garden plant of the parsley family, native to Europe and Asia, and cultivated extensively in America as a table vegetable. It grows from two to three feet in height, bearing attractive, fernlike leaves and bright-yellow flowers. The edible portion is the long, white tapering root, which has a sweetish flavor, agreeable to most people. The roots of the wild parsnip are somewhat sharp in taste, but cultivation has made them more delicate and increased their size. Parsnips thrive in rich, deep soil. In the latitude of New York, the seed is sown in April and covered with earth half an inch deep. After the plants come up, they should be thinned until about six inches apart. If neglected, they run wild and become troublesome weeds.

The parsnip is distinctly a winter vegetable, whether used as a table food or as fodder for cattle. The quality of the roots is improved,



COMPOSITION OF A PARSNIP

As a heat producer parsnips average well with most vegetables They are rich in starch and sugar (carbohydrates), and are a nutritious and palatable addition to the winter diet

rather than injured, by frost. Those for immediate use are generally taken up in October or November, and stored in damp sand or earth; the others may be left in the ground until needed. Parsnips are appetizing when boiled, baked, stewed with meat, fried, or made into fritters. They have about the same nutritive qualities as carrots, which they resemble in size and shape (see CARROT). B.M D.

Scientific Name. The parsnip belongs to the family *Umbelliferae* (which see). Its botanical name is *Pastinaca sativa.*

PARSONS, KAN. See KANSAS (back of map).

PARSON'S CAUSE. See HENRY, PATRICK.

PARSONS ENGINE. See SHIP (Construction).

PARTHENON, *pahr' the non,* a temple of ancient Greece, one of the most famous relics of antiquity, and generally considered the most perfect building ever constructed. It stood on the Acropolis at Athens, and was dedicated to Athene (Minerva), patron deity of the Athenians. No other temple was quite so sacred. The building was about 228 feet in length, 101 feet in width, and sixty feet in height. As it was in the Doric style of architecture, the great pillars, thirty-four feet in height, eight at each end and seventeen at each side, were severely plain. One of the most beautiful features of the temple was the frieze, wrought in low relief and extending entirely around the outer wall of the cella and over the columns at either end. It depicted the great Panathenaic procession in which all classes of Athenians assembled to do honor to the goddess. Gigantic sculptures ornamented other parts of the building. Rich colors—gold, red, and blue—

were used in the decoration of these designs. The building was constructed of white Pentelic marble, and the tiles of the roof of Parian marble. Within there were two halls, one of which contained the great ivory and gold statue of Athene by Phidias, who superintended the building of the temple. The architects were Ictinus and Callicrates.

The Parthenon, like so many other beautiful buildings of Athens, dates from the time of Pericles. Begun in 447 B.C., it was sufficiently completed by 438 to install the statue. It served its original purpose until about the sixth century, and then became a Christian church dedicated to the Divine Wisdom, and later to the Virgin. Later, when Athens was captured by the Turks in 1458, it was a Mohammedan mosque, and a minaret was added, but throughout these changes, it was almost perfectly preserved. When the Venetians were striving to conquer Athens in 1687, the Parthenon was used as a powder house by the Turks, and suffered much from an explosion which killed 300 people and completelv destroyed the central portion of the building. Many of the sculptures were afterward taken to London (see ELGIN MARBLES).

Even with these changes, the Parthenon is still a beautiful and inspiring sight. The pillars now lie scattered on all four sides of the temple, just as they fell following the explosion in 1687. The site was made orderly in 1830, when the new Greek monarchy was founded, irrelevant obstructions were cleared away, and the fallen sculptures excavated. The temple is most complete at the west end, where a double row of columns still stand intact, as well as a good deal of the wall of the interior chamber, extending round both sides. By a queer coincidence, eleven out of the seventeen columns on the north and south sides are standing. At the east end, only the front row of columns is complete. A project to raise the ruined pillars is being considered by archaeologists, and if carried out would be undertaken by the Greek government, assisted by the advice of the directors of the archaeological schools of Great Britain, France, Italy, Germany, and America.

Related Subjects. For illustration of the building as it was and is now, see "The Glory That Was Greece," in the articles ARCHITECTURE and GREECE. See, also, ATHENS, for location, and the article NASHVILLE, TENN.

PARTHIA, an ancient empire of Central Asia, to the southeast of the Caspian Sea. The Parthians were of Turanian stock, of the same race as the Huns, Bulgarians, and Comans of the ancient world. They lived a simple, primitive life, being fond of warfare and expeditions and indifferent to commerce and agriculture. They were remarkable for their bravery, and were famed for their peculiar method of fighting on horseback, armed only with bows and arrows. The training began during boyhood, and such skill was attained that the warrior could use his weapon with ease and effectiveness whether his horse was stationary or at a gallop, advancing or retreating. Since his object was to keep constantly in motion before the enemy, he would ride backward as if in retreat, after he had discharged an arrow, in order to gain time to adjust another arrow to the bow.



LOCATION MAP
The irregular black area was ancient Parthia.

The Parthians maintained their independence from the time of their settlement in the district to the sixth century B.C., when Cyrus, the great Persian conqueror, took the country and organized it into a satrapy, or principality, under Darius. Alexander the Great included Parthia in his conquests, and following his death, the country became a part of the kingdom of Syria, founded by Seleucus. About 250 B.C., the people revolted and formed a separate kingdom under Arsaces, who founded a dynasty of tyrannical rulers. Subsequent conquests extended the dominion to the Euphrates and Indus, and made Parthia a powerful and flourishing empire with the capital at Hecatompylos.

The Parthians successfully resisted the Romans, who repeatedly invaded their territory, and the Battle of Nisibis, A.D. 217, the final conflict of Rome and Parthia, was the fiercest of the struggles. The Romans, in fact, purchased peace at a heavy price. After this, internal dissension and corruption so undermined the Parthian monarchy that in 226 it was overthrown by a revolt of the Persians, and the dynasty of Arsaces gave place to the new Persian Empire, the Sassanian monarchy founded by Artaxerxes I.

PARTICIPLE. The word is derived from the Latin for *partake.* In English grammar the participle is a form of the verb which "par-

takes" of the nature of adjective or noun. It still retains its verb character, however, and may have an object, a complement, or an adverbial modifier. In this respect, therefore, the participle is like the infinitive (which see); so that, with the infinitive, it is frequently classed as a *verbal*.

Take for illustration the transitive verb *draw*. In the active voice, *drawing*, the *present participle*, expresses action in progress; *drawn*, the *past participle*, expresses finished action; *having drawn*, the *perfect participle*, makes use of an auxiliary verb to express the idea of action which has just been completed. In the passive voice, *being drawn* is the present, *drawn* the past, *having been drawn* the perfect participle.

Uses of the Participle. *As an Adjective.* "A towering statue known as *Liberty Enlightening the World* stands at the entrance to New York harbor." In this sentence there are two words ending in *ing*, the distinguishing mark of the present participle; but *towering*, though participial in form, is not so in use, and has none of the verbal powers of the participle. Being used only to describe, it is a pure adjective, belonging to the class sometimes called "fossil participles." *Enlightening*, on the other hand, is a true participle; it not only modifies the noun *liberty*, thus making it an adjective by use, but takes *world* as a direct object, thus asserting its verbal nature. *Known* is a past participle, used adjectively to modify *statue*, and is itself modified by an adverbial phrase.

As a Noun. The present participle, or a participial phrase formed from it, may serve as a noun in four different ways: as the subject, object, or complement of a verb, or as the object of a preposition. In the old proverb, "Doing nothing is doing ill," the first *doing* is a participle used as a noun, and with its object, *nothing*, serves as the subject of the sentence. The second *doing* is the predicate complement, taking as its object the noun *ill*. In the sentence, "I prefer riding swiftly to going so slowly," the participle *riding* is the object of *prefer*, and, by virtue of its verbal character, is modified by the adverb *swiftly*. Similarly, *going*, the noun object of the preposition *to*, is modified by the adverb *slowly*.

Many grammarians call the participle, in certain of its noun uses, a *gerund*, and the names *verbal noun*, *verb-noun*, *noun-verbal*, and *infinitive in "ing"* are also used—the latter name being given because the thought expressed by the participle may be expressed in the same fashion by the infinitive; as, *To do* nothing is *to do* ill. This, however, is a much more complicated treatment, and those who favor the simplifying of English grammar prefer to consider the verbal noun and the gerund as noun uses of the simple participle.

It is necessary to distinguish between the present participle and the abstract noun ending in *ing*. For instance, in the sentence, "Living well does not mean simply the eating of three square meals a day," *living* is a true participle, but *eating* is an abstract noun which could not take any of the modifiers of a verb. Whenever a word ending in *ing* is preceded by an article or a qualifying adjective, it is an abstract noun. By changing the sentence to read, "Living well does not mean simply eating three square meals a day," we make *eating* a participle, object of a verb, and completed by an object of its own.

Used Independently. The participle has the same independent uses as the infinitive. It may belong to the sentence as a whole, without modifying any individual word; as, *Granting* all that, the mistake still seems inexcusable; *speaking* of adventures, I once had an interesting experience; that *being* the case, you may proceed with the examination. This is sometimes called the "absolute construction." The participle may also be used independently in exclamations: *Coming* to-day! *Reading* Homer!

Errors in the Use of the Participle. The chief error in the use of the participle is that of the "dangling participle," which occurs in written language more often than in speech An example is *Walking up the hill, a church came into view* Obviously, the church was not walking up the hill, but the manner of writing makes it necessary for one to read the sentence twice to see its meaning. The phrase "dangles" about without modifying anything. To avoid this error, we can put the participial phrase into a clause by including a subject; the sentence then becomes *As we were walking up the hill, a church came into view*

PARTINGTON, MRS., the pen name of Benjamin Penhallow Shillaber (which see).

PARTNERSHIP, an association of two or more persons whose object is to carry on business for gain, but who are obliged to share losses, as well. The relation must be voluntary and may be formed by written contract, verbal agreement, or by evidences and acts which tend to prove the existence of a partnership. If the object of the business is contrary to public policy or illegal, the contract is not binding. The rules and laws governing partnership vary in different jurisdictions, and are the subject of conflicting decisions in the courts. All the general rules applying to contracts govern contracts of partnership. See CONTRACT.

After the partnership is formed, the association is generally called *a firm*, and business is transacted under a firm name. The firm becomes a sort of legal individual, having its own creditors, debtors, capital, and property, and being responsible to the partners for their shares of the capital which has been contributed by them for the conduct of the business. The firm as such cannot sue or be sued, but all

suits must be in the name of the partners individually.

Kinds of Partnership. A *general partnership* is an association for the transaction of general business. When an association is formed for the prosecution of a single enterprise, it is known as a *particular partnership*. *Limited partnerships* are also formed in which there is one general partner liable for the debts of the firm, associated with one or more special partners responsible only to the extent of their contributions to the capital. Some states authorize limited partnership associations, in which the members are all special partners; these associations differ from corporations and joint-stock companies chiefly in that their capital stock is not divided into a large number of transferable shares (see CORPORATION).

Partners, Their Rights and Duties. Extensive powers are extended to the members of a firm, and heavy responsibilities rest upon them One partner has a right to hold all others to their agreement, and to have access to all records of the firm's business. Each member of the partnership is responsible for the acts of any one of their number, and each is liable for any debts contracted by a partner in the transaction of the general business. Partners may not use the general funds for their own benefit, and are responsible for a strict accounting of all expenditures in the firm's name

The members actively conducting the business are known as the *real*, or *ostensible*, partners. Members whose relation to the firm is not publicly known, and who take no part in the business management, are called *secret*, or *dormant*, partners. *Silent* partners take no active part in the business, but share in the liabilities and the profits. *Nominal* partners assist in the business, but receive no share of the profits.

Dissolution. A partnership may be dissolved by agreement, by operation of law, or by judicial decree. Any unlawful action of the firm legally dissolves the association. Any change in membership effects a dissolution of the partnership, and if business is continued, it must be under new articles of agreement. At dissolution, the debts of the firm are paid first, then the capital is distributed; if all this is insufficient to meet the debts, the latter are paid out of the personal property of the members. A *liquidating* partner is one chosen to take charge of the settlement of the business. Death of a partner operates to dissolve the firm, but there must be an accounting to his heirs.

PARTRIDGE, *pahr' trij*. The bird that people in the Northern and Eastern states call quail or bobwhite is known to Southerners as *partridge*, while New Englanders use this name for the ruffed grouse. Canadians, in turn, call the Canada grouse the wood, cedar, or spruce partridge. See QUAIL; GROUSE.

There is, however, a group of birds in the eastern hemisphere that scientists regard as true partridges. About 150 species are included. Typical of this group is the bird that sportsmen call the Hungarian partridge, and which has been imported into America in large numbers for breeding purposes. Its common name is gray partridge. This species is found throughout Europe, especially in Great Britain, and occurs also in Northern Africa and Western Asia. The largest specimens are about a foot long. The bird has ash-gray plumage on the upper parts of the body, with brown and black markings, and the male has a distinguishing crescent-shaped spot of deep chestnut on the breast. Grains and insects are sought as foods; the nest is laid usually on the ground, and contains from twelve to twenty eggs. The gray partridge is a favorite game bird in Europe. D.L.



Photo Visual Education Service

A PAIR OF PARTRIDGES
The male, more splendidly arrayed than his mate, is at the right

Scientific Name. True partridges belong to the family *Phasianidae*. The scientific name of the gray partridge is *Perdix cinerea*.

PARTRIDGE, WILLIAM ORDWAY (1861-), an American sculptor, art critic, and lecturer. One of the delights of his artistic life was to present in marble and bronze the busts of the world's great poets. Included in his well-known series are the busts of Shakespeare, Whittier, Longfellow, Milton, Byron, Tennyson, Burns, Poe, and Edwin Markham.

Partridge was born in Paris. He was educated at Columbia University, New York City, and studied sculpture in Florence and Rome. His first large work of note was the fine bronze *Hamilton*, erected in Brooklyn, N. Y. That city also possesses his equestrian *General Grant*. In 1894 he completed a statue of Shakespeare, which was unveiled in Lincoln Park, Chicago. Other notable examples of his art are two

statues of *Nathan Hale*, erected in Saint Paul and Washington; the *Kaufman Memorial* in Rock Creek Cemetery, Washington; *Peace*, in the Metropolitan Museum, New York; *Destiny* and *Nearing Home*, in the Corcoran Art Gallery, Washington; a *Pieta*, in Saint Patrick's Cathedral, New York City; and *Pocahontas*, Jamestown, Va. Partridge has written several books on art subjects, as well as some fiction.

PARTRIDGE PEA. See CASSIA.

PARTS OF SPEECH, in grammar, are classifications of words associated according to their use and meaning. Such a division of words into classes is not arbitrary, or invented merely for convenience; words themselves present natural divisions, and grammarians have merely given names to the classes. There are in all eight parts of speech: nouns, pronouns, adjectives, verbs, adverbs, prepositions, conjunctions, and interjections.

Certain of these classes are closely related to each other; for instance, a noun is often used for an adjective, as in "a *gold* ring," or an adjective for a noun, as in "We pity the *poor*." A verb form, too, frequently takes the place of a noun, as in the sentences "*To go* will be the wisest policy," "*To have done* such a thing would have meant ruin"; yet the fundamental distinction between the parts of speech remains.

Related Subjects. A detailed discussion of the various parts of speech will be found in these volumes in the following articles:

Adjective	Noun
Adverb	Preposition
Conjunction	Pronoun
Interjection	Verb

PART-TIME SCHOOLS. See CONTINUATION SCHOOLS.

PASADENA, CALIF., a beautiful residential all-year resort city, situated in Los Angeles County, eleven miles northeast of the Los Angeles business center, and twenty miles from the Pacific Ocean. While not essentially an industrial or commercial city, Pasadena has a considerable number of thriving industries, chief of which is the preparation of citrus fruits for the market. Population, 1928, 62,100.

General Description. Pasadena lies in the foothills of the Sierra Madre Mountains, overlooking the San Gabriel Valley, and it has a setting of great natural beauty. It is famed for its beautiful homes, luxurious resort hotels, and its wide, tree-lined thoroughfares. Pasadena has fifteen public-owned parks, the most attractive of the number being Oak Grove, Central Park, Library Park, La Pintoresca, Washington, McDonald, and Lower Arroyo. Busch Gardens, privately owned but open to the public, comprise thirty acres of beautiful landscaping and rare horticultural specimens. An unusual feature of this park is the exhibit of familiar scenes from folklore and fairy tales that are faithfully reproduced and always prove a delight to children.

The famous Rose Bowl, or Stadium, seating 70,000 persons, occupies a site in Brookside Park, near the heart of the city. Winding past Pasadena's most palatial homes is Orange Grove Avenue. Next in beauty is Santa Rosa Avenue, known as "The Mile of Christmas Trees," as its beautiful evergreen trees intertwine over the roadway.

Eight miles distant, on Mount Wilson, is the Solar Observatory of the Carnegie Institution of Washington. In San Marino, just across the Pasadena boundary, is the Henry E. Huntington Library, which takes high rank among the great libraries of the world. To the north of the city lies Mount Lowe, and in the distance, snow-capped San Antonio (Old Baldy) towers majestically.

Tournament of Roses. The Tournament of Roses is held on New Year's Day of each year. For more than thirty years, this has been an annual event, and so fine are the floral displays and other features that the fame of the festival has spread throughout the country. See page 2401, for illustration.

Education. Chief among the educational institutions is the California Institute of Technology, to which the International Education Board has granted an appropriation of several million dollars for the construction of an astrophysical observatory and laboratory. Included in the school system are the Junior College, open-air schools, and the Opportunity School. There are also numerous private schools and a military academy

With an enviable position in the world of legitimate drama, Pasadena claims one of the finest community theaters in the world Erected at a cost of $350,000, this "Little Theater" houses the activities of a non-profit civic organization, numbering more than 4,000 members, with an available cast of 1,100 players

Transportation. In addition to the electric interurban lines, the city is served by three transcontinental railroads—the Atchison, Topeka & Sante Fe, the Union Pacific, and the Southern Pacific Motorbus and electric lines extend to Los Angeles, the beaches, and other suburban communities.

History. Pasadena was settled in 1874, a year after a band of colonists from Indiana had formed an association and purchased the San Pasqual Rancho of 4,000 acres. At this time, Pasadena entered upon an era of progress. In 1886 the city was incorporated. It is governed by a board of directors elected by the people, and has a city manager.

PASCAL, BLAISE (1623-1662), and **PASCAL'S LAW.** This French religious philosopher, mathematician, and author was born at Clermont-Ferrand. He never went to school, but was taught by his father. He proved himself a precocious child, and though he was never termed a learned man, his later life was one of

great performance. He early attracted the attention of Descartes and others by his mathematical genius, displayed particularly in his *Geometry of Conics*, which appeared in 1639. Through his sister he became interested in the Jansenist faith, and in 1654 allied himself with the convent at Port Royal. Though observing its rule in part, he never actually became one of its solitaries. In 1656-1657 he wrote his *Provincial Letters*, directed against the Jesuits, in reply to the condemnation of Arnauld, a leader of Port Royal, by the Sorbonne for heretical doctrine. These attacks were masterpieces of irony, though not always sound in scholarship.

Pascal's *Thoughts*, published in 1670, are a mixture of sophistry and expressions of great profundity, and reveal extraordinary intelligence. Despite poor health and physical suffering, he decided to supplement his destructive criticism contained in *Provincial Letters* with an *Apology for the Christian Religion* (a defense of Jansenism), which was never completed. Always faithful to his interest in the development of science, Pascal maintained, however, that the only perfect knowledge comes through Christian revelation.

His work in mathematics and physics contributed more to his immortality than did his religion. He was the first to attempt a philosophy of mathematics. His work on pressure of liquids, with the formation of the physical law known by his name (see below), is applied practically to-day in the hydraulic presses, hydraulic elevators, and hydraulic jacks, and, applied to gases, is used in vacuum pumps and the air compressor With Fermat he also worked on the theory of probabilities.

Pascal's Law. The theorem which bears his name relates to the mechanics of fluids, and is as follows

Any external force exerted on a unit of area of a confined liquid is transmitted undiminished to every unit area of the interior of the containing vessel

PASCUA, *pas' ku ah*, FLORIDA. See PONCE DE LEON; FLORIDA.

PASIG, *pah' sig*, RIVER. See MANILA.

PASQUE, *pask*, FLOWER. See ANEMONE.

PASS. See JETTY.

PASS. See VALLEY.

PASSAIC, *pa sa' ik*, N. J., an important manufacturing and residential city in Passaic County, at the head of navigation on the Passaic River. A dredged channel to Newark Bay also gives an outlet to the Atlantic Ocean. The city is located in a populous industrial area, being twelve miles from New York City, nine miles from Newark, and four miles from Paterson. In this city of many diversified industries, the manufacture of cotton and woolen goods is the leading enterprise. Population, 1928, 71,800 (Federal estimate).

General Description. Passaic is situated upon rolling and hilly ground which readily lends itself to beautification. There are many paved and well-kept streets, lined with shade trees, and there is a handsome residential section. In connection with the park system, there are several recreation centers maintained for children.

Transportation. Passaic is served by three railroads, the Erie, the New York, Susquehanna & Western, and the Delaware, Lackawanna & Western. The city is also well served by trolley and motorbus lines connecting with all neighboring communities. The deepened channel of the Passaic River has provided lighterage service between Passaic and New York Harbor and Port Newark.

Industries. The industrial establishments include large cotton and woolen mills, print and chemical works, hosiery mills, rubber mills, handkerchief factories, belting mills, iron and brass works, and insulated wire and cable works. Power for manufacture is supplied by electrical companies, which make special rates for industries. Passaic, together with Newark, Paterson, and Clifton, has recently built a dam at the Wanakque watershed, assuring a good supply of water for many years to come.

Institutions. Among the noteworthy institutions of the city are the General, the City, and Saint Mary's hospitals, a home for orphans, and numerous fine buildings housing welfare organizations

History. Passaic, known as Aquackanonk Landing until 1852, was settled as early as 1676. It was incorporated as a village in 1869, and became a city in 1875 The commission form of government was adopted in 1911. G.S.A.

PASSAIC RIVER. See NEW JERSEY (Rivers and Lakes).

PASSAMAQUODDY INDIANS, one of the tribes of Algonquian Indians. See INDIANS, AMERICAN (Families and Tribes).

PASSAU, *pahs' ou*, TREATY OF. See SCHMALKALDIC LEAGUE.

PASSE. See ROULETTE.

PASSENGER PIGEON, a wild pigeon, about fifteen inches in length, with delicately tinted plumage and long, graceful wings and tail, found in large numbers in Eastern North America until the latter part of the nineteenth century. The beautiful passenger pigeon is now extinct, a sacrifice to the greed and foolish waste of hunters. What is believed to have been the last passenger pigeon died in 1914, in the Zoölogical Gardens of Cincinnati.

The accounts of early bird students concerning the numbers of these pigeons seem almost incredible. Wilson, in 1808, estimated that a flock which he observed in Kentucky contained more than two and a quarter billion birds, and Audubon, in 1813, wrote that he watched passenger pigeons pass for three days in succession in a flock so dense and continuous that the sun was darkened, and the sound of their wings was like thunder. Their nesting colonies covered thousands of acres, which they practically desolated, every large tree in the nesting area being loaded with dozens of nests. The birds

were strong fliers and ranged daily as far as a hundred miles in search of food.

The rapid disappearance of these birds was due to hunters who came to their nesting places each year. They killed the birds by shooting them, after blinding them with lights at night and knocking them off the trees with poles, or stifling them with burning sulphur, or cutting down their roosting places. What the hunters could not eat or preserve was left to be devoured by wild animals, vultures, and hogs. It required but comparatively few wholesale slaughters of this sort to reduce the great flocks to the few pigeons preserved in zoölogical parks, and these at last suffered complete extinction. See PIGEON.

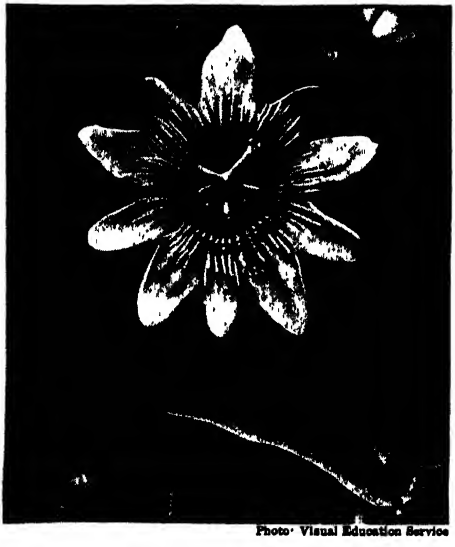


Photo Visual Education Service

PASSENGER PIGEON

Scientific Name. The passenger pigeon was one of the family *Columbidae*. The scientific name of the species is *Ectopistes migratorius*.

PASSION, *pash' un,* **FLOWER,** a name applied by early Roman Catholic missionaries in America to certain plants whose flower parts, they fancied, represented Christ's passion, or suffering. For example, the fringes in the flower they thought were symbolic of the crown of thorns; the five anthers, of the marks of His wounds. The divisions of the pistil represented the nails of the cross, and the stamens, the hammers that drove them in. The leaf symbolized the spear, the tendrils represented whips and cords. The column of the ovary was the pillar of the cross; the calyx, the glory of the nimbus.



Photo· Visual Education Service

THF PASSION FLOWER

The species of the passion-flower genus are found chiefly in the tropical and semi-tropical regions of America. Among them is the familiar passion flower of the Southern states, a woody vine which trails, or climbs by tendrils. Its natural habitat is dry soil in the states from Virginia to Florida, and west to Texas, but it is cultivated in the North, where it is esteemed as an arbor or veranda covering. In the Southern cotton fields, it is sometimes a troublesome weed. The large, purplish and white flowers have a bell-shaped calyx, with five divisions; within the five petals is a crown of purplish hairs, or bristles, forming a fringe. The fruit, an oblong berry which turns yellow when ripe, is called *Maypop*, and is edible. It is the size of a small apple.

Another species, which grows in moist thickets in Pennsylvania and southward, bears greenish-yellow flowers and a smaller berry. A Brazilian passion flower is widely cultivated in Northern greenhouses for its beautiful blossoms, which are pale blue, white, or rose-colored. This plant will grow in the open as far north as Washington, D. C. Some species grow in Italy and other warm countries of the Old World. B.M.D.

Scientific Names. The passion flowers belong to the family *Passifloraceae*. The species of the Southern states is *Passiflora incarnata*. The Pennsylvania species is *P. lutea*. That of Brazil is *P. caerulea*.

PASSION PLAY, an impressive dramatic performance, representing the passion and death of Christ, and presented at Oberammergau, in Bavaria, Germany, every ten years. It is not a survival of the type of mystery plays that were popular in Northern France, Italy, England, and Germany in the Middle Ages, and subsequently repressed; it is the outcome of a vow made by the villagers in 1633 to commemorate the passion of Christ, in gratitude for their deliverance from a plague then raging in the vicinity. This vow has been kept and the performance has regularly taken place since the seventeenth century, every ten years, with but few exceptions. The one to have been given in 1920 was withheld until 1922, because the emotions aroused by the World War had not yet subsided. Almost the entire village is represented in the rôles, but the greatest honor that can come to any of the villagers is to be chosen for the part either of Christ or of the Virgin Mary. The presentation always attracts thousands of visitors



Photos: U & U

Simplicity and Reverence at Oberammergau. At upper left, a street of the village; note the religious frescoes on the front of the large building. Below, the theater, also decorated with statues and frescoes. At right, an humble blacksmith, Hugo Rutz, who played the rôle of Caiaphas in the 1922 presentation of the great drama.



Photos: U & U

Devout Actors in the Passion Play. At upper left, Andreas Lang, who played the rôle of Peter; Anton Lang, his son, whose part was that of the Christ Below, Guido Mayr, the Judas of the play, at work on a statuette of Saint Joseph; Gregor Breitsamter, who played the rôle of Herod. At right, one of the actors conversing with a local chimney sweep; rank and station mean little in Oberammergau.

from all parts of the world. Similar presentations have been given in America.

Oberammergau, the village, lies among the foothills of the Alps in the province of Upper Bavaria, about sixty-five miles southwest of Munich The people lead a simple, quiet life, farming, wood carving, and toy-making being the principal occupations The play has become a part of the very lives of the people, and just before the time arrives for them to portray the characters of the Bible story, they put aside their work and enter upon a period of spiritual preparation.

PASSION WEEK. Christian bodies use this term to describe the week in Christ's life which begins on Passion Sunday, the fifth Sunday in Lent, marking the beginning of His passion, or final sufferings. Beginning with Passion Week, the Roman Church veils all sacred pictures, crucifixes, and statues. This custom is also followed in the Episcopal Church during Holy Week, immediately preceding Easter. See LENT; JESUS CHRIST

PASS'OVER, a feast held in Jewish families at the time of the first full moon of spring, on the fourteenth day of Nisan, the first month of the sacred year. It commemorates the sparing of the Hebrews on the eve of the Exodus from Egypt, when God smote the first-born in every Egyptian home but *passed over* the Israelite houses, whose doors had been marked by the blood of a lamb. At that time, by divine command, the lamb was slaughtered, with religious ceremony, and then roasted and eaten, together with unleavened bread and bitter herbs The eating of unleavened bread (*mazzoth*) for seven days is an integral part of this memorial feast, which is, therefore, frequently called the feast of unleavened bread

Definite rules for the festival appear in all the collections of the laws in the Pentateuch. At the beginning of the feast, the eldest son reverently asks its meaning, and the father then relates the story of the first Passover. The feast ends with the singing of psalms. In the Christian Church, the Passover is replaced by the Lord's Supper (*Luke* XXII, 17-21), and Jesus is regarded as the sacrifice foreshadowed by the paschal lamb. Paul writes, "For even Christ our Passover is sacrificed for us" (*I Corinthians* V, 7)

PASSPORT. An official document granted by the authority of a nation to one of its citizens or subjects, to enable him to travel in foreign lands. It certifies to his citizenship and requests for him safe passage and all lawful aid and protection while abroad. Most countries on the continent of Europe require that travelers shall possess passports; in some of them, the regulations are very strict.

In Canada, passports are issued by the Passport Officer, Department of External Affairs, at Ottawa. The cost of a Canadian passport is $5. In the United States, the Secretary of State may grant and issue passports, and cause passports to be granted in foreign countries by diplomatic representatives of the United States. Since October, 1926, a large number of American consular officers in foreign countries have been authorized to issue passports to American citizens. Previously, American citizens in other countries were able to obtain passports only by applying through the consulates to Washington.

A passport will be granted usually as a matter of right by any issuing authority, except in time of war, to any citizen who makes proper application, which must be in the form of a written affidavit, stating the fact of his citizenship and giving his legal residence. It must contain a description of his person, two signed photographs, and be accompanied by a certificate from a credible witness that the facts mentioned are true; it must be attested by an official authorized to administer oaths. The fee that must accompany the application is ten dollars. A passport is good for two years from date of issue, but school teachers in the United States are permitted extensions of an additional two years.

PASTELS, *pas' telz.* See CRAYONS.

PASTEUR, *pas tuhr',* LOUIS (1822-1895). When the school children of France were asked to select the greatest man their country had produced, they voted, not for Napoleon, but for the chemist and biologist, Louis Pasteur. That Pasteur's contribution to human welfare overshadows the achievements of conquerors and statesmen is generally acknowledged. It was he who really founded the science of bacteriology. Before his time, it was generally believed that lifeless matter was transformed into living substance by a process called "spontaneous generation" Pasteur proved that the living forms which appear in liquids, as in fermentation, are always transmitted from the air in the form of invisible organisms (germs), and that this process can be controlled or prevented. As a result of this discovery, the preventive treatment of infectious diseases has become possible.

Pasteur was born at Dôle, France, in the Jura district. At the age of twenty he began the study of chemistry at the École Normale in Paris, later specializing in that subject at the Sorbonne. In 1867 he was appointed professor of chemistry in the Sorbonne, and in 1888, when his labors were crowned by the dedication of the Pasteur Institute, he became director of that great center of research.

Pasteur's achievements make him one of the great men of all time. His study of the process of fermentation and of the diseases that affect spirituous and malt liquors resulted in improvements in brewing, distilling, and wine-making that saved France more than enough to pay the huge indemnity incurred by the

Franco-German War; and he saved the silk industry of the country by discovering the parasite that was causing the ruinous silkworm disease. He laid the foundation for the isolation of the germs of tuberculosis, cholera, diphtheria, lockjaw, and other infectious diseases; he discovered the method of checking hydrophobia by inoculation; and he showed how anthrax in cattle and sheep, fowl cholera, and similar diseases of animals could be prevented or conquered. The process of arresting fermentation in milk, known as pasteurizing (see MILK), is another result of his labors, and has been the means of saving the lives of untold numbers of children. Pasteur also made valuable contributions to antiseptic surgery (see SURGERY). In brief, he helped to make the world a better and a safer place of habitation, both for human beings and for animals.



Photo Keystone

LOUIS PASTEUR

Best known to the average citizen as the organizer of Pasteur Institutes for the cure of hydrophobia and lockjaw (tetanus). Scientists honor him as the discoverer of bacteria, and place him among the immortals

The Pasteur Institute, where research work in bacteriology is constantly carried on, has been called the "world's greatest life-saving institution." The Rockefeller Institute for medical research, in the United States, is similar in methods and purpose.

Related Subjects. See BACTERIA AND BACTERIOLOGY and DISEASE, and lists of articles in connection with those subjects.

PASTORAL POETRY, in general, is any poetry which treats of country life. More specifically, it is an artificial form which uses shepherds and shepherdesses as its characters, a rural setting, and love as its theme, but which in reality portrays the ideas, the feelings, and even the happenings of life on a higher plane. Almost invariably it has flourished when life was especially corrupt, or at least artificial. Among the Greeks, pastoral poems were known as idylls, and were most successfully attempted by Theocritus. Vergil's *Eclogues*, the most famous of Latin pastorals, have little of the true nature spirit about them, and the same may be said of the poems of Horace, and Catullus.

In England, the first pastoral of note was Spenser's *Shepherd's Calendar*, which appeared in 1579, and for the next twenty-five years, no other theme was so common in English literature as the more or less artificial longing for rural simplicity. Marlowe wrote the *Passionate Shepherd*, Sidney the *Arcadia*, Ben Jonson *The Sad Shepherd*, and Shakespeare *As You Like It.* Milton's *Comus* and *Lycidas*, the one a masque, the other an elegy, have both the pastoral setting. Pope's pastoral poetry is thoroughly conventional, but such later poets as Cowper, Burns, Shelley, and Wordsworth show in their work the true love and understanding of nature (see ROMANTICISM).

PATAGONIA, a geographic term formerly applied to that portion of South America lying south of the thirty-eighth parallel. The region was discovered and named by Magellan in 1520 and was left unclaimed until 1881, when by treaty it was divided between Chile and Argentina. The name has now no political significance. The portion of land east of the Andes constitutes the Argentine territories of Rio Negro, Chubut, and Santa Cruz; that on the west side of the mountains is the Chilean territory of Magallanes, containing the southernmost city in the world. Long known as Punta Arenas, this city has been called Magallanes since 1928. See CHILE; ARGENTINA; illustration, page 5413.

PATAN, *pah' tun*, a city in Nepal (which see).

PATAPSCO RIVER. See BALTIMORE, MD.

PÂTÉ DE FOIE GRAS, *pah ta' deh fwah grah'*. See GOOSE.

PATENT, a title. See HOMESTEAD LAWS.

PATENT, an official document, issued by a national government, securing to one who has perfected an invention the exclusive control of the device as to manufacture, vending, and sale, for a limited number of years.

Origin of Patent Rights. In England, in an early day, the sovereign exercised the sole prerogative of granting privileges and monop-



Photo: Visual Education Service

THEY LIVE ON THE SOUTHERN TIP OF A CONTINENT

Although Patagonia is no longer a political unit, the native Indians of the section are still known as Patagonians Most of them owe allegiance to Chile; a few live in Argentine territory. (See Patagonia, page 5412.)

olies of every description to those whom he favored. The custom was often abused by grants which oppressed the masses of the people while benefiting a few, and the injustice of many of these "letters patent," as they were called, led in the reign of James I (1624) to the abolition of every one of them then effective, except such as related to the—

> . . . sole working or making of any manner of new manufacture within the realm, to the true and first inventor of such manufacture, which others at the time of making such letters patent and grants should not use, so they be not contrary to law, nor mischievous to the state, by raising the prices of commodities at home or hurt of trade or generally inconvenient.

Such was the first legislation pertaining to patents; it embodies the spirit of all patent laws since that time. It will be noted that this English idea centered upon benefits to the people from inventions; in this it differs from the American principle, that of stressing protection to inventors, and thus giving encouragement to genius to create something new.

What May Be Patented. To be entitled to a patent, a person must have invented or discovered some new and useful art, machine, manufacture, or composition of matter; or some new and useful improvement of the same. Every one of these words has been carefully defined by court rulings. A machine is not new simply because it differs in size or shape from another similar mechanism, or because it presents a different arrangement of parts of an old machine. Some new *principle* must have been introduced to make it patentable; and it must be useful. A child's toy can be as readily patented as a steam engine.

It must be an invention, but not every improvement is an invention. A patent will not be granted for such an alteration in device as would naturally and spontaneously occur to any skilled mechanic or operator. An invention means the finding out, the contriving, the creation of something that did not previously exist. Originality is the test of inventions. Whether an invention is the result of a fortunate discovery, or comes as the reward of years of careful experiments, is immaterial; patents will be granted as readily in the one case as in the other. Novelty and utility must go hand in hand to constitute a patentable invention.

Patent laws prescribe the exact procedure which must be followed in applying for a patent. For example, in the United States, drawings must be submitted on bristol board of specified thickness and size, precisely 10×15 inches. Any person in Canada or the United States seeking a patent may secure all necessary information as to procedure from the Commissioner of Patents in Ottawa, Ont., or the similar official in Washington, D. C.

In the Dominion of Canada. The British North America Act gives the Canadian



UNITED STATES PATENT OFFICE, WASHINGTON, D. C

Parliament exclusive control of patent legislation. The first comprehensive patent laws were those of 1886. A revision of the Canadian Patent Act became effective on September 1, 1923.

In the Dominion, a patent may be granted for a term of eighteen years. On filing of application, a fee of $15 is required, and a payment of $20 when the patent is granted—a total of $35. An examination is made to determine whether the new device offered is patentable; an appeal from an adverse decision of the Commissioner of Patents goes to the Executive Council for decision. A patent becomes void if it is not commercialized within two years of the date of the grant. The total number of patents issued in the Dominion now exceeds 292,000.

In the United States. The Federal Constitution places all patent legislation in the hands of Congress; no state may pass a patent law. As early as 1790, the first patent laws were passed, and these have been modified from time to time.

In 1870 all of the various measures were revised, and few changes have since been made. Until 1925 the Patent Office existed as a bureau in the Department of the Interior; in the year named, it was transferred by Presidential order to the Department of Commerce.

If a request for a patent is refused by the Commissioner of Patents, on the advice of his examiners, an appeal may be taken to the United States Court of Customs and Patent Appeals; its decision is final.

When a patent is granted, the inventor has a monopoly "to make, use, and sell" his invention for a period of seventeen years. No person may make a patented article even for his own exclusive use without infringing. A fee of $20 must accompany an application for a patent, and $20 more is payable when the grant is issued. A patent, on expiration, can be extended only by special act of Congress; no such extensions have been made since 1887.

The increase in the number of patents issued in the United States has been remarkable. In 1825 a clerk in the Patent Office, in order to protect himself in his career, resigned his position because, in his opinion, the 30,000 patents already issued covered about everything new that could possibly be made, and within a few months, he thought, the Patent Office would have to be closed. At the present time, the number of applications for patents ranges from 85,000 to 95,000 per year, and the number granted is between 43,000 and 55,000. The total number issued reached 1,000,000 on August 8, 1911, about 120 years after the first was granted. Since that date nearly a million more have been issued

[For other monopolies of beneficial nature conferred by governments on their citizens, see COPYRIGHT; TRADE-MARK.]

PATENT MEDICINES. See MEDICINE AND DRUGS (Dangerous "Secret Remedies").

PATERSON, ISABEL. See CANADIAN LITERATURE (English Canada: Fiction).

PATERSON, N. J., the third largest city of the state, and the county seat of Passaic County, is situated on the Passaic River,

more than legendary, for though he left an autobiography, or *Confession*, written in crude Latin, this places the emphasis on his work and not on his life. Many relics of this venerable man were held sacred for a thousand years, but in the Reformation, some were destroyed. At least one credited to him, a four-sided iron bell, is in the Museum of Arts and Sciences in Dublin. Much study has been bestowed upon him, but even the facts outlined above are by no means accepted without controversy. What is accepted without question is the date of his festival. All over the world, wherever the Irish have penetrated, March 17 is celebrated as Saint Patrick's feast day. See IRELAND (History: The First Great Event); SHAMROCK.

PATRIOTISM. "It is sweet and glorious to die for one's country," runs the familiar line from a poem by Horace. This Roman poet lived in the first century before the birth of Christ, but in that far-off period of the history, patriotism was not a new thing. The Romans of that time were telling their children the story of Regulus, who, before, had heroically advised not to make peace with Carthage and returned to the land of the

Industries. Paterson has none of the smoky atmosphere common to most manufacturing cities No soft coal is used by its factories, as the silk fabric must be kept clean in its manufacture The city is also a great textile-dyeing center, piece-goods-dyeing having grown to great proportions in and around the city In fact, every silk process, with the exception of the reeling of raw silk from the cocoon, is carried on here Hat bands, sewing silk, and hosiery are important branches of the silk industry. The making of shirts and manufacture of linen thread also rank high Formerly, Paterson was known as a locomotive center, but has now replaced that industry with a rapidly growing aviation-motor industry This establishment, the Wright Aeronautical Corporation, produced the motors for the various transoceanic and record-breaking flights in 1927 and 1928. Other important manufactured products include art glass, asbestos materials, bedding, brushes and brooms, confectionery, lumber and mill products, piano cases, trunks and bags, bottle caps, rubber goods, recording instruments, wall paper, clothing, dyed furs, and automobile accessories. The city is also the home of one of the large producers of submarine cable.

Institutions. In 1925 Paterson began modernizing its school plant A year later, a high school for girls was opened on a seven-acre tract in the heart of the city. There are also state normal and vocational schools. Other institutions include the Danforth Free Memorial Library, the gift of Mrs Mary E Ryle, four hospitals, many handsome churches, and a large number of fraternal organizations.

By joint action on the part of Paterson and other cities of the Passaic River Valley, a trunk sewer was constructed to Robins Reef in New York Bay in 1924 The city also cooperated with neighboring cities in securing an ample water supply from the Wanaque Valley.

which inspires men and women to be good citizens; such a patriotism makes them sacrifice leisure and pleasure and money and personal preferences to serve the state. It makes voting and intelligent study of the problems of the day a sacred duty. To the right-minded person,

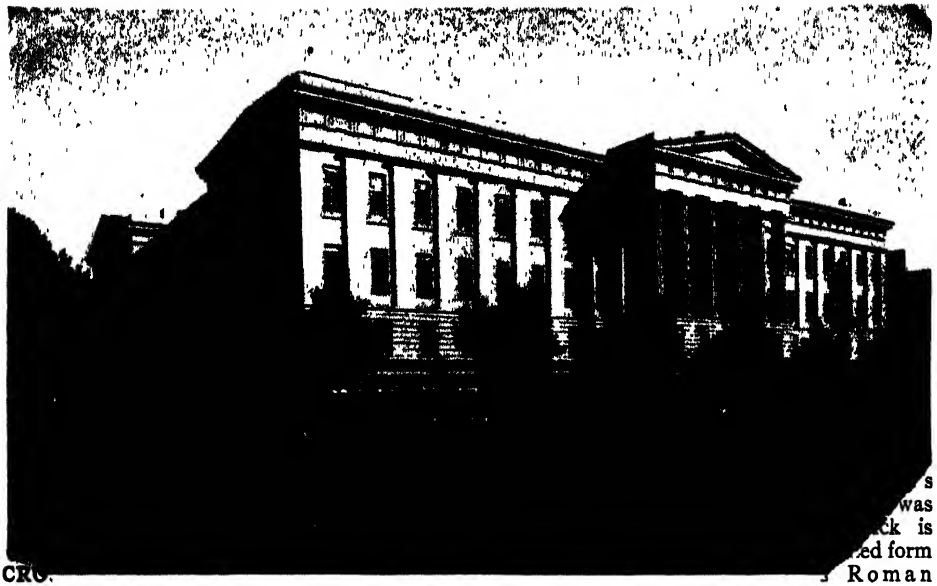
There are no points of the compass on the chart of true patriotism.

Cultivating Patriotism. The spirit of patriotism should be fostered in the hearts of children both at home and in the schoolroom. They should have access to books and magazines which will instill noble ideals and inspire to heroic living. Moreover, the teachers and parents themselves should at all times set an example of patriotic devotion. The boy who sees his father evading the law and neglecting his duties as a citizen, while his mother shows herself indifferent to the great questions pertaining to national life, is not being encouraged to love his country better than his life. Instructors should find in the teaching of such subjects as history, civics, and literature opportunities for fostering patriotic sentiment and they should prepare special programs for the anniversaries of great historic events. Every pupil should be taught to love his country. Its only claim to fame rests on its mention in the Bible as the island to which Saint John was banished, and where he received the visions described in the book of *Revelation*. The island is bare and rocky, and the inhabitants are chiefly occupied in fishing. The indented coast forms numerous bays and harbors favorable to commerce, as once they were to piracy. The chief harbor is Scala. Cotton stockings, knitted by the women, and pottery form the chief exports of the island. The skill of the islanders as sailors is proverbial.

A monastery dedicated to the memory of Saint John was established on Patmos in 1088, and it flourished for centuries. The library of the monastery possessed many valuable manuscripts; most of these are yet preserved, though they are now widely scattered. Conditions under Turkish rule were deplorable. Italy took Patmos during the Turco-Italian War, 1912, and in the same year, delegates from the Aegean islands met at Patmos and expressed a desire for a union with Turkey. However, Patmos remained under Italian rule. The population is about 4,000.

PATNA, *put' nah*. See INDIA (Cities).

PATRIARCH, *pa' trih ark*, is derived from a Greek word meaning *progenitor*, the founder of a tribe. In ancient times, a patriarch was the father or ruler of a family or tribe. The term was applied in Hebrew history especially to Abraham, Isaac, and Jacob, the fathers of the Jewish nation. Abraham was the head of the patriarchs, and Jews were identified as "the people of the God of Abraham"



UNITED STATES PATENT OFFICE, WASHINGTON, D. C.

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PATRIC
pah trish' an. In
current speech we use the term *patrician* to describe a person of distinguished bearing and aristocratic manner, while the word *plebeian* is applied to one who is the opposite—common in appearance and possibly crude in manner. In ancient Rome, these names had a political significance that is wholly lacking to-day. The original Roman people (*populus Romanus*) comprised all the free citizens of the state. Their descendants reserved for themselves the rights of citizenship—they were the "men with fathers," or patricians (from the Latin *pater*, meaning *father*). As Rome began to expand through conquest, and inhabitants of conquered towns were brought to the city, a new class arose, one having no political rights. These "common people" were the plebeians. The early history of the republic is largely the story of the struggle between these two classes. Gradually, the plebeians gained full political equality, and in 467 B.C., they compelled the Senate to permit marriage between the two classes. Eventually,

control of patent legis- When a patent is grant



SAINT PATRICK
[Reproduced from an old painting.]

is life seems to readers of modern times most romantic and adventurous. At the age of sixteen, he was captured by pirates from Ireland and carried to that island, where for six years he tended the flocks of an Ulster chieftain. During these years of his slavery, he became a devoted Christian, and after his escape to France, entered monastic life. Directed by a vision to return as a missionary to Ireland, he obeyed the call in 432, and for the rest of his life worked zealously in various parts of the island. His labors were so miraculously successful that he came to be known as one who "found Ireland all heathen and left it all Christian." There he founded over 300 churches, and he personally baptized over 12,000 people.

Naturally, many legends grew up about the name of this popular saint. A favorite is the one which represents him as charming the snakes of Ireland by his music so that they followed him to the seashores, where they were driven into the water and drowned. Indeed, much that is told about Saint Patrick is little

more than legendary, for though he left an autobiography, or *Confession*, written in crude Latin, this places the emphasis on his work and not on his life. Many relics of this venerable man were held sacred for a thousand years, but in the Reformation, some were destroyed. At least one credited to him, a four-sided iron bell, is in the Museum of Arts and Sciences in Dublin. Much study has been bestowed upon him, but even the facts outlined above are by no means accepted without controversy. What is accepted without question is the date of his festival. All over the world, wherever the Irish have penetrated, March 17 is celebrated as Saint Patrick's feast day. See IRELAND (History: The First Great Event); SHAMROCK.

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The Basis of Patriotism. What is the underlying sentiment that makes men patriots? It is the conviction that life itself—the most precious gift of Providence—is of secondary importance to the life of the nation. As an American poet has written—

> Life, for my country and the cause of freedom,
> Is but a trifle for a worm to part with

Shakespeare makes one of his characters say—

> I do love
> My country's good with a respect more tender,
> More holy and profound, than mine own life.

The Swiss patriot, Arnold Winkelried, so measured the value of his life when he rushed into the ranks of the Austrians at the Battle of Sempach, and "made way for liberty." Such, too, was the spirit of Nathan Hale, whose dying utterance, "I only regret that I have but one life to lose for my country," expresses the feeling of true patriots of all lands and ages.

A Living Patriotism. This spirit of loyalty and self-sacrifice animates all of those who practice patriotism in everyday life. There is no finer quality of love for country than that which inspires men and women to be good citizens; such a patriotism makes them sacrifice leisure and pleasure and money and personal preferences to serve the state. It makes voting and intelligent study of the problems of the day a sacred duty. To the right-minded person,

> There are no points of the compass on the chart of true patriotism

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Outline on Patriotism

Motto·

"Let our object be our country, our whole country, and nothing but our country."—Daniel Webster.

Essay on Patriotism:

(a) What is patriotism?
(b) Some patriots of past history
(c) Patriots of to-day
(d) How can I best practice patriotism?

Biography:

Robert Bruce	Joan of Arc
Demosthenes	Thaddeus Kosciusko
Benjamin Franklin	Horatio Nelson
Nathan Hale	Laura Secord

Poems:

Paul Revere's Ride—Longfellow
My Native Land—Coles
Marco Bozzaris—Halleck
Your Flag and My Flag—Nesbit

Quotations:

How sleep the brave, who sink to rest,
By all their country's wishes blest. —Collins.

My country, 'tis of thee,
Sweet land of liberty,—
Of thee I sing. —Samuel F. Smith.

Breathes there a man with soul so dead
Who never to himself hath said,
This is my own, my native land! —Scott.

Land of my sires! what mortal hand
Can e'er untie the filial band
That knits me to thy rugged strand! —Scott.

Our country, to be cherished in all our hearts, to be defended by all our hands. —Winthrop.

What a pity is it
That we can die but once to save our country!
—Addison.

Supplementary Reading:

Gettysburg Address—Lincoln
Man Without a Country—Edward Everett Hale
The Leak in the Dyke
Commemoration Ode—Lowell
Horatius at the Bridge—Macaulay

Related Subjects. Biographies of the following men and women conspicuous for patriotism are given in these volumes:

Adams, John	Joan of Arc
Adams, Samuel	Kosciusko, Thaddeus
Allen, Ethan	Kossuth, Louis
Brock, Sir Isaac	Lee, Richard Henry
Bruce, Robert	Lincoln, Abraham
Brutus, Marcus Junius	Mazzini, Giuseppe
Decatur, Stephen	Morris, Robert
Demosthenes	Nelson, Horatio
Emmet, Robert	O'Connell, Daniel
Franklin, Benjamin	Revere, Paul
Hale, Nathan	Ross, Betsy
Hamilton, Alexander	Secord, Laura
Hancock, John	Tell, William
Henry, Patrick	Wallace, Sir William
Hofer, Andreas	Winkelried, Arnold

PATRIOT WAR. See CANADA (History: Struggle for Responsible Government).

PATROCLUS, *pah tro' klus.* See ACHILLES, HECTOR; TROY (Trojan War); ILIAD.

PATRONS, *pa' trunz,* **OF HUSBANDRY.** See GRANGE.

PATROON, *pa troon',* **SYSTEM,** a plan adopted by the Dutch West India Company for the colonization of New Netherland, in what is now New York state. The plan as first adopted permitted any member of the company to select as his own property any tract of land outside of Manhattan Island, extending sixteen miles along one side of a river or bay, or eight miles along two sides, and as far back into the country as convenient, provided he should, within four years, establish there a colony of fifty persons over fifteen years of age. Later, the tract of land was limited to four miles along a river bank or coast, and only eight miles inland. The period of settlement was shortened to three years, and the privileges of the system were granted to all desirable inhabitants of New Netherland. The system had many objectionable features, for the patroon, or proprietor, had about the same power as a feudal lord, and in time there developed in New York a typical landed aristocracy. The effects of the system were felt well into the nineteenth century; in 1845 an anti-rent rebellion, started by some of the tenants on the old patroon estates, was suppressed by military force. See ANTI-RENTERS.

PATTERSON, ELIZABETH, wife of Jerome Bonaparte. See BONAPARTE, subhead.

PATTI, *pat' e,* ADELINA JUANA MARIA (1843-1919), one of the greatest sopranos the world has ever known. She was born at Madrid, Spain. Her father was Italian, her mother Spanish, and both were gifted singers. Adelina's early childhood was spent in America, and her first training in music was received in New York from her brother-in-law, Maurice Strakosch, formerly a well-known singer. When she was but seven years old, she began to sing in the most prominent concert halls of New York, and when sixteen, attracted unusual attention by her marvelous singing as Lucia in Donizetti's opera, *Lucia di Lammermoor.* Two years later she began to take leading operatic parts in London, and immediately was proclaimed by English critics as one of the world's greatest singers. Her work in France, Spain, Italy, Norway, and Sweden was so successful that, in many of the larger cities of those countries, vast crowds of admirers followed her through the streets.



Photo U & U

ADELINA PATTI

In 1868 Madame Patti married the Marquis de Caux of France, but was divorced in 1885. Soon afterward she married the famous tenor Nicolini, who died in 1898; in 1899 she married Baron Cederstrom of Sweden. In 1885 she bought a castle at Craig-y-Nos, in Wales She erected a private theater there, and from time to time she gave concerts, not only for the wealthy and noted, but for the Welsh peasants in the neighborhood. Her kindness to these humble people made her one of the most beloved women in Great Britain, and many a poor Welsh family went to her for help or consolation in time of trouble.

After 1890 Patti made no regular concert tours, but frequently filled special engagements in America and Great Britain, and sang in the United States as late as 1911. She wisely avoided the heavy rôles of Wagner's operas, thereby preserving her voice, in much of its original beauty, to old age.

PAUL, the name of five Popes of the Roman Catholic Church. Of these, Paul I was least important. He was Pope from 757 to his death in 767, and was the successor of his brother, Stephen III. This Pope had the support of the temporal power, for Pepin, king of the Franks, gave him assistance in his struggle against the Lombards.

Paul II, Pope from 1464 to 1471, was a nephew of Pope Eugenius IV, by whom he was created a cardinal in 1440. On being elevated to the Papacy, he tried to unite the Christian kingdoms of Europe against the Turks, who were threatening to invade Italy

The most pronounced tendency of Paul II was his hostile attitude toward the Renaissance (which see). He opposed the new learning, not because he objected to scholarliness as such, but because he feared that the introduction of the ancient Greek culture might mean the restoration of pagan religion and pagan morals.

Paul III was born in Tuscany in 1468, and was made a cardinal by Alexander VI in 1493. In 1534 he was elected to the Papal chair, and in that high office continued the efforts at reform which had marked his previous administration as bishop of Ostia. In the interests of reform, he several times tried to summon a council, which finally met at Trent in 1545, having been repeatedly postponed because of the constant struggle between Francis I of France and Emperor Charles V (see TRENT, COUNCIL OF) It was Paul III who excommunicated Henry VIII of England, and restored the Inquisition for the suppression of heresy He also made Michelangelo chief architect of the Vatican and of Saint Peter's Paul III died in 1549.

Paul IV, Pope from 1555 to 1559. He was seventy-nine years of age when he was elected to the Papal throne, but he showed an unexpected vigor, acting on the reform principles which he had instituted in his earlier offices He reorganized the Inquisition, established a censorship of books, bettered the conditions of the poorer classes, and demanded a stricter administration of justice. Queen Elizabeth of England, who followed the Catholic Mary, was at her accession declared by Paul IV to be illegitimate.

Paul V, Pope from 1605 to 1621, was of the famous Borghese family, and was made a cardinal in 1596. The first two years of his Papacy were disturbed by a dispute with the republic of Vienna Paul demanded that ecclesiastics should not be brought to trial before other than ecclesiastical tribunals, and when the senate and the doge refused to submit, he issued sentence of excommunication against them. Still they remained obdurate, and the controversy raged until 1607, actual recourse to arms being at times threatened, but a compromise was at last effected by Henry IV of France. Paul V was active in the suppression of heresy, the establishing of religious orders, and the promotion of the missionary movement



Photo Visual Education Service

SAINT PAUL

[Statue by Thorwaldsen, now in Copenhagen]

PAUL, ROBERT W. See MOVING PICTURES.

PAUL, SAINT (3-67), the great apostle to the Gentiles, and one of the chief agents of the early Church in establishing Christianity. Until his conversion, he was called SAUL OF TARSUS, for his parents were prominent and influential Hebrews of that Cilician city. The fact of his birth in Tarsus made Saul a Roman citizen, though a Jew. The boy was sent to Jerusalem to be educated under the learned Gamaliel, one of the most distinguished rabbis of the day, and there he was trained according to the strict Jewish faith and traditions. Since all boys in his nation were taught some trade, he learned how to make tents, and later, while preaching in various towns, he supported himself in this way.

As a young man, Saul was made a member of the council at Jerusalem, and not long after Stephen, the first Christian martyr, was stoned to death, the high priest appointed him to take charge of the work of persecuting the new sect. It was while he was on his way to Damascus in the interest of this work that he experienced conversion—an event which changed the whole course of his life (see *Acts* IX). This happened when he was about thirty-two years old. Immediately, with characteristic energy, and to the astonishment of the Jews, he began to preach in the synagogues; his success in obtaining converts so stirred the Jews and the governor of the city that he was compelled to flee secretly.

First Christian Work. After going to Arabia, Paul, as he then called himself, returned to his native city. There he stayed for several years, until his friend Barnabas urged him to begin work at the Church of Antioch in Syria. For a year these two men labored among the Gentiles who had formed this new Church, obtaining many converts and placing their organization upon a firm basis. To the disciples in Antioch the name *Christian* was first given.

Missionary Journeys. This was the starting point in Paul's work of evangelizing the pagan world, for in the following year, A.D. 46, the Church which he had aided sent him out with Barnabas on the first of his three missionary journeys. These men worked their way north, founding churches in the principal cities until they reached Antioch in Pisidia, the chief city of the Roman province of Galatia. There, upon the invitation of the rulers of the syna-



"IN JOURNEYINGS OFTEN, IN PERILS"

Ruins of the traditional house from which Paul escaped the fury of his enemies during his early ministry
The window through which he is believed to have been let down is over the doorway back of the tree

gogues, Paul made the great address recorded in *Acts* XIII, 16-41. As the chief people of the city were aroused against the Christians by the Jews, Paul and Barnabas were driven away; they then returned over their old route to place upon a firm basis the new churches which they had established.

Five years after the first journey, Paul started out on a second trip, taking several followers with him. He visited both Phrygia and Galatia, then went over into Macedonia. On this expedition, he founded the Church at Philippi, and so established Christianity in Europe. While preaching in Philippi, he discovered that there was a decided advantage in being born a Roman citizen, for when the magistrates who had cast him into prison with Silas discovered his citizenship, they immediately freed him and his companion, asking them to leave the city. The Apostle and his followers then turned south, going down into Greece, where Paul delivered an address before the philosophers of Athens on Mars Hill.

In A.D. 54, Paul started out on his third and last missionary journey. Passing through Phrygia and Galatia, he arrived at Ephesus, the capital of Ionia, and one of the most influential cities of the East. For three years he made it the center of his operations, with great success.

Later Years. Then, in spite of warnings, Paul returned to Jerusalem. There he would have been seized by the mob had not Lysias, the commander of the Roman garrison, carried him off as a prisoner to the castle. Later he was sent to Felix, the procurator, to be tried in Caesarea, but he was still in prison two years later, when Festus came into power. When Festus, willing to please the Jews, asked him to go to Jerusalem for trial, Paul availed himself of his right as a Roman citizen and appealed to Caesar. So he was sent to Rome, after making a notable defense before Agrippa (*Acts* XXVI, 1-23). There he was kept in confinement for two years more, although his friends were allowed to visit him. They labored for his release, which was probably obtained, for there are later accounts of his work in Asia and in Macedonia. According to tradition, he was again arrested and was beheaded, probably as a result of the persecution against the Christians begun by Nero.

Paul's Epistles. These were letters to his friends and various churches; they form a considerable part of the New Testament. On his second missionary journey, he wrote *First* and *Second Thessalonians*; on the third trip, he wrote *Galatians*, *First* and *Second Corinthians*, and *Romans*, and while in Rome in prison, *Colossians*, *Philemon*, *Ephesians*, and *Philippians*. After his release, he wrote *Titus* and *First* and *Second Timothy*. *Second Corinthians* describes his own life more completely than any other book, for most of the Epistles deal with the truths of Christianity and its application to life In this Epistle occurs the memorable passage (XI, 24-27) which describes the suffering and disasters that befell him:

Of the Jews five times received I forty stripes save one.

Thrice was I beaten with rods, once was I stoned, thrice I suffered shipwreck, a night and a day I have been in the deep;

In journeyings often, in perils of waters, in perils of robbers, in perils by mine own countrymen, in perils by the heathen, in perils in the city, in perils in the wilderness, in perils in the sea, in perils among false brethren;

In weariness and painfulness, in watchings often, in hunger and thirst, in fastings often, in cold and nakedness.

Related Subjects. The reader is directed in these volumes to the various Biblical references above, and to the articles GAMALIEL and MARS HILL. The most important of the Epistles are also treated under the proper headings

PAUL, SAINT VINCENT DE. See CHARITY, SISTERS OF.

PAUL AND VIRGINIA. See SAINT PIERRE, JACQUES.

PAULISTS, *pawl' ists*, the familiar name of an order of Roman Catholic priests properly called *The Congregation of Missionary Priests of Saint Paul the Apostle.* It was founded in New York City in 1858 by Father Isaac Thomas Hecker, and is the only religious order which originated in America. Organized for missionary work in the United States, the Paulists direct their efforts toward propagating their faith among non-Catholics. The churches of this order, especially those of New York City and Chicago, are noted for their excellent boy choirs.

PAUL REVERE'S RIDE. See REVOLUTIONARY WAR (Lexington and Concord); REVERE, PAUL.

PAUNCEFOTE, *pawns' foot*, JULIAN, First Baron (1828-1902), a British statesman, connected intimately with English and American diplomatic relations for many years. He was born at Munich, of English parents, educated in England, France, and Switzerland, and in 1852 was called to the English bar. After practicing law in Hong Kong and serving as attorney-general there, he became in 1873 chief justice of the Leeward Islands. In 1882 he was made Under-Secretary of State for Foreign Affairs, and in 1885 was a delegate to the Suez Canal Commission at Paris.



Photo Brown Bros

SIR JULIAN PAUNCEFOTE

In 1889 Pauncefote became minister to the United States, and during his term of office, in 1893, the title was changed from minister to ambassador. The Bering Sea controversy, the Venezuela affair, and the revisions of the Clayton-Bulwer Treaty, known as the Hay-Pauncefote Treaty, were among the problems with which he dealt during his thirteen years' stay at Washington. When The Hague Conference was called, in 1899, Pauncefote attended as senior British delegate, and he was largely instrumental in having the permanent Court of Arbitration established. For this achievement, he was created Baron Pauncefote of Preston. See HAY-PAUNCEFOTE TREATY.

PAUPERISM, *paw' pur iz'm.* Legally, a pauper is a person who is in such a state of poverty that he must depend upon public or private charity for support. There are many families that are compelled to ask for help under stress of unusual conditions—sickness of the chief breadwinner, scarcity of employment, etc.—but such families are not pauperized by accepting occasional charity. Pauperism may be defined as a condition of permanent, or chronic, destitution. Its causes and remedies are subjects of earnest study by modern social workers. It can exist only when the agencies for the prevention or the relief of poverty are inadequate. Poverty results chiefly from improvident methods of living (indulgence in drink, extravagance, etc.), misfortune (sickness, accident, loss of sight or hearing, death of the breadwinner, etc.), and old age; and the final result of the imperfect handling of these conditions is pauperism. L.L.B.

Related Subjects. Under the heading CHARITY, in these volumes, will be found a discussion of the methods employed in modern times to alleviate the conditions of the poor Old-age pensions, juvenile courts, and social settlements are all important agencies of relief, and all operate against the increase of pauperism. Each of these is described under its proper heading.

PAVEMENT, a hard, durable covering applied to a road or pathway, to afford easier transportation for heavy loads or for pleasure vehicles. A description of the various kinds of pavement is given in the article ROADS AND STREETS.

PAVIA, *pah ve' ah.* See ITALY (The Cities).

PAVING CEMENT. See ASPHALT (Asphalt Pavement); CEMENT.

PAVLOVA, *pahv lo'vah*, ANNA. See DANCING.

PAWCATUCK RIVER. See RHODE ISLAND (Rivers and Lakes).

PAWNBROKER. In every large city there are people engaged in loaning small sums of money on articles of clothing, watches, jewelry, and other personal effects that are left with them as security. Such a man is a *pawnbroker*, and the articles left with him are *pawned.* If the person receiving the loan does not repay it with interest within a specified time after the debt becomes due, the pawnbroker has the right to sell the article left with him.

When properly conducted, pawnbroking is a lawful business, and it is beneficial to people with limited means who cannot borrow money at a bank on the security they are able to give. But

until very recently, pawnbrokers' offices were private enterprises, and many abuses arose, such as charging exorbitant rates of interest, failing to credit the borrower with amounts paid on his loan, and finally selling the article pawned when the loan had been more than paid. In large cities there were always some unscrupulous pawnbrokers who would receive stolen goods, knowing them to be such, and sell them at a large profit. These abuses became so general that legislation regulating pawnbroking has been enacted nearly everywhere. In some states, cities are allowed to regulate the business by city ordinance, but in most cases, the state law prevails, assuring uniform practice.

In general, these regulations require the pawnbroker to keep a record book in which every article received is described, and to submit this book on demand to the police or other officers having authority to demand it. They are not allowed to receive goods from one under the influence of drink nor under a specified age, nor to sell the goods until after the expiration of the time for their redemption. On account of the expense incurred in making small loans, a high rate of interest is usually allowed, but the rate is sometimes limited to three per cent a month.

In Illinois a state pawnbroker association was formed in 1898, opening offices in Chicago. The association does a legitimate business and pays the stockholders a good rate of interest. In New York there is a society with a capital of over $5,000,000, which is also a financial success. These and other similar societies show that pawnbroking can be carried on in a lawful manner and be financially successful.

In France, lending agencies for small loans are carried on as a form of charity, and are associated with town councils, hospitals, and existing charity bureaus. Usually they are endowed, in which case no interest is charged. In Paris there are excellent storage facilities, and the agency is practically a safe deposit for the poor man. In Germany the private pawnshops are strictly regulated, and may be prohibited entirely by any city which so desires. There are also state and municipal pawnshops, the latter of which are often in connection with the savings banks. There are only two cities in Russia, Leningrad and Moscow, which maintain municipal pawnshops. The Bank of England may make loans at five per cent on plate and non-perishable articles, and private pawnshops in England are licensed and strictly regulated.

The three golden balls, so long employed by pawnbrokers as a trade sign, originated with the money-lenders of Lombardy who established themselves in England in medieval times



Photos. Visual Education Service; St Clair

THE PAWPAW

Upper left, fruit and leaf. At right, group of full-grown trees, twenty to twenty-five feet high, growing in groups. Below, branch and flower.

PAWNEE INDIANS. See INDIANS, AMERICAN (Most Important Tribes).

PAWNEE RIVER. See KANSAS (Rivers).

PAWPAW, a small tree or shrub belonging to the custard-apple family, which produces a fruit, also called pawpaw, that looks somewhat like the banana. The plant is distributed through the Southern United States, and is found as far north as Kansas, Michigan, New Jersey, and Western New York. Its leaves spread out in umbrella-like whorls, as do those of some species of magnolia, suggesting the relationship of the tree to certain tropical species. The pawpaw grows to a height of from twenty to thirty feet, and bears fruit two to six inches in length, with a greenish-brown skin. The yellow pulp is soft and sweet, but has not enough taste to make it popular as a table fruit. The wood of the tree is too soft and coarse to be of value, but its thin fibrous bark is utilized in making fish nets.

Another tree called *pawpaw*, or *papaya*, is grown in the tropics for its edible fruit. In Florida it is cultivated for the local market. This species is a member of the passion-flower family. It is a palmlike tree, with its leaves grouped in the form of a rosette at the top of

the unbranched stem. The fruit looks like a muskmelon, and has a yellow flesh that is eaten fresh, used in salads when ripe, and boiled as a vegetable when unripe. The tree yields a milky juice which natives in the tropics use for medicinal purposes. The fruit itself is also employed as a face bleach. B.M.D.

Scientific Names. The American pawpaw belongs to the family *Anonaceae*. Its botanical name is *Asimina triloba*. The tropical species belongs to the family *Papayaceae* and is known as *Carica papaya*.

PAWTUCKET, *paw tuk' et*, R. I., the second largest city of the state, known as the birthplace of the American cotton-manufacturing industry. It is situated in Providence County, in the northern part of the state, at the head of navigation of Narragansett Bay, about four miles northeast of Providence, the state capital, and forty miles southwest of Boston Population, 1928, 73,100 (Federal estimate)

Pawtucket covers an area of nearly nine square miles, and is the business center of adjacent manufacturing villages. The city lies on both banks of the Pawtucket River, the falls of the same name providing abundant power for its varied and extensive industries. Several imposing bridges connect with Central Falls, its sister city. There are 163 miles of strects, over 100 being improved. The parks and playgrounds of the city cover 242 acres, and there are many prominent business structures and handsome residences



JOHN HOWARD PAYNE

Transportation. The city has the service of the New York, New Haven & Hartford Railroad, with connections to the lines of the Boston & Albany and the Boston & Maine railroads There is overnight boat service to New York, and motor transportation between Pawtucket and various important New England cities The state pier in the Pawtucket River is open throughout the year; there is a government-maintained channel to Narragansett Bay.

Industries. In 1790 cotton-weaving by the factory system was introduced into the United States by Samuel Slater, and cotton thread was first manufactured. From this small beginning has grown the great cotton-textile industry with its kindred industries of bleaching and dyeing, as well as the weaving of silk and rayon goods. There are many machine shops producing machine tools, textile and other machinery, rolled steel, pressed-metal products, nuts, bolts, hardware, spindles, and insulated wire. The city is the oldest center of tennis-racquet manufacture in the United States. Other manufactured products include cotton and silk lace, shirtings, collars, hosiery, tubular fabrics, braid and shoe laces, tire fabrics, fish line, awnings, cotton wadding, jewelry, chemicals, cement, and dental supplies. One of the largest thread plants in the country, that of the J. & P. Coats Company, whose product is known to every American housewife, is located here.

Institutions. Among the noteworthy buildings are the Sayles Memorial Library, Memorial Hospital, state armory, Home for the Aged, several private, industrial, and business schools, and a new senior high school erected at a cost of $1,700,000. The Collyer Monument and the soldiers' memorial monument ornament the city The old Slater mill, which witnessed the beginning of the cotton industry, is still standing, and in it Pawtucket lays claim to the establishment of the first Sunday school in the United States.

History. The name Pawtucket, meaning "Fall of the Waters," is of Indian origin. The original village was founded in 1670 by Joseph Jenks, Jr, a worker in iron. That part of the city which lies on the east bank of the river was originally a part of Seekonk, in Bristol County, Mass., and it became Rhode Island territory in 1862. The part on the west bank was known as North Providence until 1874, when that town was divided. The two villages were then incorporated as the town of Pawtucket, which in 1886 was chartered as a city.

PAWTUCKET RIVER. See RHODE ISLAND (Rivers and Lakes).

PAYEE. See BILL OF EXCHANGE; CHECK; NOTE.

PAYNE, JOHN HOWARD (1792-1852), an American writer and actor, whose fame is secure as the author of *Home, Sweet Home*, one of the greatest songs in any language. He was born in New York, and studied there at Union College until he was sixteen, when he appeared for the first time on the stage. His youth and his undeniable genius won him immediate and great popularity. At a "benefit" performance for him, the receipts were over $1,400, a large sum in those days. Payne traveled over the United States, playing

various parts, and was everywhere welcomed by crowded houses and greeted as a prodigy. In 1813 he went to London, and he acted in England and in France for twenty years. He also wrote or adapted numerous plays, none of which retained its popularity.

In *Clari, or the Maid of Milan*, first written as a play, but turned by Payne into an opera, *Home, Sweet Home* was heard for the first time. Managers and actors were made rich by this opera, but Payne received very little of the proceeds. After considerable financial trouble, he received an appointment as United States consul to Tunis. While serving in this uncongenial office, he died, and in 1883 his body was brought back to his native country and interred at Washington, D. C. During the ceremony, a thousand voices sang his immortal hymn. A portrait statue by Alexander Doyle stands at his grave.

Possibly there never was a better summary of Payne's life than that poetically expressed by Will Carleton, although he may have overemphasized somewhat the dreariness of the actor-author's existence. In the course of a poem relating to *Home*, Carleton says:

But he who in thy praises was sweetest and best—
Who wrote that great song full of soothing and rest—
"Through pleasures and palaces though we may roam,
Be it ever so humble, there's no place like home"—
He who, in a moment unfettered by art,
Let that heavenly song fly from the nest of his heart,
He wandered the earth, all forgot and alone,
And ne'er till he died had a home of his own!
He wandered the earth at his own dreary will,
And carried his great heavy heart with him still;
He carried his great heavy heart o'er the road,
With no one to give him a lift with his load;
And wherever he went, with his lone, dreary tread,
He found that his sweet song had flown on ahead!
He heard its grand melodies' chime o'er and o'er,
From great bands that played at the palace's door;
He heard its soft tones through the cottages creep,
From fond mothers singing their babies to sleep;
But he wandered the earth, all forgot and alone,
And ne'er till in Heaven had a home of his own!

Original Manuscript. The original manuscript of *Home, Sweet Home* was presented to the Sibley Musical Library of the Eastman School of Music at the University of Rochester, New York.

PAYNE-ALDRICH TARIFF. See TAFT, WILLIAM HOWARD (Administration); TARIFF.

PEA, the common name of an important genus of plants belonging to the pulse, or legume, family. Of the several species, the best-known is the garden vegetable whose delicious unripe seeds are so generally liked and used as a table food. These are borne in oblong, green pods, which follow the delicate white blossoms. Field peas, which are grown in considerable quantities in the Northern United States and in Canada, are used as food for stock. There are also several species that bear lovely fragrant flowers and are cultivated as ornamental garden plants. Among these are the sweet pea (which see), the chick pea, and the everlasting pea. All species are supposed to be derived from wild plants native to Southern Europe and Southwestern Asia.

The Common Garden Pea. Under cultivation, many varieties of the garden pea have been developed. There are, however, two dis-



PEAS IN THE POD

tinct types, those bearing seeds with smooth coats, and those whose seeds are wrinkled. The smooth-seeded, which are the hardier and so are planted the earlier, are usually low-growing plants; the wrinkled-seeded produce a tall twining stem that requires some sort of a support. The seeds of both kinds are planted about three inches deep and about two inches apart in the row, but the seeds of the taller varieties are planted in rows about forty inches apart, as compared with twenty-four to thirty inches for the others. In the latitude of New York, the planting season is from March to June, and early varieties are harvested from June on. A variety known as *sugar pea*, which is sown in April, bears edible pods that are picked when small and tender (in July) and are cooked like string beans.

Food Value and Use. Peas are among the most nutritious of vegetables, especially dried peas, which are baked, used for soup, and cooked in various other ways. They have a high percentage of both protein and carbohydrates (starch and sugar), averaging 24.6

per cent of the former, and 62.0 per cent of the latter. Like other legumes, peas are a valuable tissue-forming food. Green peas are 7.0 per cent protein and 16.9 starch and sugar; their delicate, appetizing flavor makes them a most delightful summer vegetable, one that almost everybody likes. Green peas, too, may be had the year round in canned form, and if properly canned, are not less palatable than when served fresh. Dried peas have the high fuel value of 1,655 calories per pound (see CALORIE); green peas, a value of 465 calories. Wisconsin is the center of the canning industry. In most years, this state produces more than half of the American product, New York usually being second in production. Seeds for the canner are produced largely in Idaho and Montana. B.M.D.

Scientific Names. The pulse family (see LEGUMINOUS PLANTS) is called *Leguminosae* by botanists. The garden pea is *Pisum sativum*, the field pea, *P. arvense*.

PEABODY, MASS. See MASSACHUSETTS (back of map).

PEABODY, SOPHIA, the wife of Nathaniel Hawthorne (which see).

PEABODY EDUCATION FUND, an endowment made in 1867 by George Peabody, an American merchant and philanthropist, for the advancement of education in the South The original fund, including a second donation made in 1869, amounted to about $3,500,000. At the end of the first thirty years, the trustees of the fund had distributed more than $2,500,000, having given aid to numerous elementary and normal schools, besides awarding a number of scholarships. In 1875 the trustees founded, at Nashville, Tenn., a school for the higher training of teachers, known as the State Normal School. In 1887 the name of this institution was changed to Peabody Normal College. As the school grew in influence, and the scope of its activities increased, a movement was started to make it a central teachers' college for the entire South. As a result of this idea, the George Peabody College for Teachers was incorporated in 1909, and the money and property under the control of the trustees of the Peabody Fund were transferred to the trustees of the new institution, thus terminating the trusteeship of the original fund.

George Peabody (1795-1869) was born in Danvers, Mass. At the age of eighteen, he began to work for a wholesale dry-goods merchant of Georgetown, D C Later, when the firm had become established in Baltimore, he rose to be head of the company. Having built up a great fortune, he founded in London the firm of George Peabody & Co., and in that city he spent the last years of his life. His endowment for education in the South is but one of many notable contributions for the advancement of education, art, and music.

PEABODY INSTITUTE. See MARYLAND (Education).

PEABODY NORMAL COLLEGE. See PEABODY EDUCATION FUND.

PEACE, BREACH OF THE. In the days when the king was supreme in England, it was held that he had a right to peace within his realm. Whenever a crime was committed against the royal laws, the offender was arrested for disturbing "the king's peace," and was tried before a justice of the peace. In modern times, a serious crime is not considered a breach of the peace; the latter includes only those offenses which invade the right of the people to live in orderly quiet. Thus, one who indulges in violent language, or one who interferes with lawful meetings of others, or prevents others from doing lawful tasks, or one who riots, may be arrested for breach of the peace. A person who persistently annoys others may be required to deposit money, or furnish a bond to be forfeited if he lapses from good conduct, or, as it is commonly expressed, be "put under bonds" to keep the peace.

PEACE BRIDGE. See BUFFALO, N. Y.

PEACE CONFERENCE, INTERNATIONAL, a congress of the chief powers assembled at intervals at The Hague, the ultimate object of which was to be the establishment of permanent peace, the more immediate aim being the settling of international controversies by arbitration and the lessening of wanton barbarities in war. The conferences at The Hague may be regarded as a definite expression of that growing abhorrence of war that began to manifest itself toward the close of the last century. This humane feeling seemed to be growing steadily in force until the outbreak of the World War in 1914.

The conferences were initiated by Czar Nicholas II of Russia, and the first congress met at The Hague on May 18, 1899. One hundred delegates, representing the United States, Mexico, China, Japan, Persia, and Siam, and about twenty European powers, were present. Three chief questions occupied the attention of the delegates: armaments and weapons, humane regulations in warfare, and mediation and arbitration. Each nation was represented on every committee appointed, and each had one vote. A final act, signed by all the powers on July 29, embodied the conclusions reached. This act consisted of three conventions or treaties, three formal declarations, and six resolutions.

The declarations prohibited (1) the dropping of explosives from balloons; (2) the use of shells diffusing poisonous gases; (3) the use of so-called "dumdum" bullets, soft projectiles which flatten in the body. Great Britain and the United States declined to approve of the second and third prohibitions. The resolutions set forth the conviction of the conference that the



Photo O R U C

THE MAGNIFICENT PEACE PALACE AT THE HAGUE

burden of armaments should be lessened and that the size of military and naval budgets should be studied with a view to reductions. Of the three conventions agreed to, one applied the humane provisions of the Geneva Convention to naval warfare. Another comprised a perfected code of the rules of war on land. The third dealt with arbitration.

The convention relating to mediation and arbitration was generally regarded as the most encouraging work of the conference. The powers agreed to submit serious disputes to arbitration, questions involving "national honor" and "essential interests" being excepted. The machinery for adjusting grievances was provided for in a permanent arbitration body, which should meet at The Hague.

A second conference, held in 1907, attended by representatives of forty-four states, adopted thirteen conventions intended to strengthen the cause of arbitration and prevent needless cruelty in war. It established an international prize court and insisted on the inviolability of the postal service.

The peace movement suffered greatly in all belligerent countries during the World War; but since the majority of the pacifists, while believing that war is always an evil, believe also that it is not the greatest possible evil, the great war was not looked upon as a relinquishment of the peace principles. The League of Nations and the Permanent Court of International Justice, fruits of the World War, were set up to lead the nations toward permanent peace.

Related Subjects. The reader is referred in this connection to the following articles in these volumes

Arbitration (International Arbitration)	International Law
Carnegie, Andrew	International Relations
Congress	League of Nations
Geneva Convention	Permanent Court
Hague, The	Renunciation of War
	Versailles, Treaty of

PEACE CONFERENCE, WORLD WAR. See VERSAILLES, TREATY OF.

PEACE OFFERING. See SACRIFICE.

PEACE OF UTRECHT. See UTRECHT, PEACE OF.

PEACE OF WESTPHALIA, *west fa' lh ah* See WESTPHALIA; THIRTY YEARS' WAR.

PEACE PACT OF 1928. See RENUNCIATION OF WAR, GENERAL TREATY FOR.

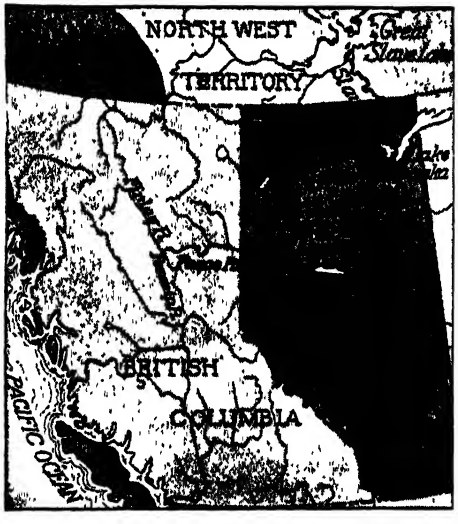
PEACE PALACE. See HAGUE, THE.

PEACE RIVER, in Western Canada, is the greatest of the tributaries of the Mackenzie River. It rises in British Columbia, cuts its way through the Rocky Mountains, then flows northeast across Alberta into the Great Slave River, just below the point at which the latter issues from Lake Athabaska Its course from the headwaters of the Finlay, its principal tributary, is 1,065 miles long, and its drainage basin includes 117,000 square miles, an area equal to nearly one-half that of Alberta.

Details of Its Course. The Peace River is formed by the junction of two streams, the Finlay, 250 miles long, and the Parsnip, 145

miles long, both of which are entirely in British Columbia.

From the confluence of these streams to the junction with the Slave River is a distance of about 815 miles. For 300 miles the Peace follows a general easterly direction, with an average fall of two and one-half feet per mile. Below the mouth of the Smoky River, it turns and pursues an irregular but generally northward direction. Below the Smoky, steep sandstone cliffs at first border the bed of the Peace River, but farther down the valley becomes wider and shallower. The average depth is from twenty to thirty feet, and the width from one-half to three-fourths of a mile. The current is always fairly rapid, seldom falling below two and one-half miles an hour. With two interruptions, there is a total distance of 1,200 miles navigable for steamers from the Rocky Mountains to the mouth of the Mackenzie River. The Peace River region is one of the few remaining large tracts of



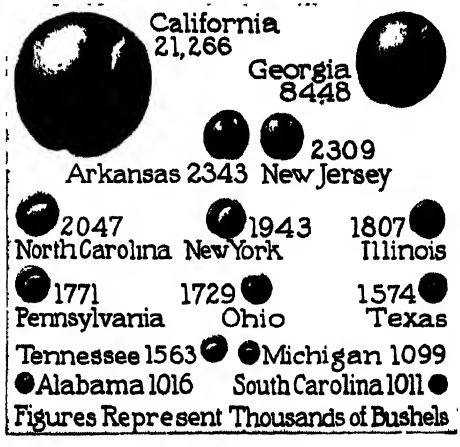
THE PEACE RIVER COUNTRY

arable land yet sparsely settled. That which is already under cultivation has proved to be exceptionally fertile and suitable for the production of cereal and root crops.

PEACE RIVER. See FLORIDA (Waterways).

PEACH, *peech.* Among orchard fruits of temperate climates, only the apple surpasses the peach in commercial importance, while in beauty, fragrance, and flavor, peaches are second to none. There is reason to believe that the Chinese cultivated peach trees over thirty-nine centuries ago; China is probably the native home of this valuable member of the rose family. The colonists who settled in Virginia planted peach trees in that favorable region before 1629, and now the United States produces more and better peaches than any other part of the world.

Distribution and Production. Though not so hardy a fruit as the apple, the peach is grown successfully in certain sections of Canada, notably in Ontario. In the United



PEACH PRODUCTION

The leading states are shown. Figures are averages for three years.

States its distribution is wide, but somewhat irregular, as it is very sensitive to frosts. It flourishes along the eastern and southern shores of the Great Lakes, where the climate is tempered by nearness to those large bodies of water; orchards are found in the eastern tier of states from Connecticut to Georgia; in the northern part of Florida there are several peach-growing areas; and the fruit is cultivated extensively in various sections of the Mississippi Valley and in California. Such a summary is, of course, very general, and does not indicate that the fruit is grown to a greater or less extent in at least forty of the states.

The accompanying chart shows the average annual yield of the leading peach states. Though Maryland and Delaware (which do not appear on the chart) are famous for their peaches, their output is comparatively limited because of the size of the states.

Classes and Varieties. The familiar division of peaches into *clingstone* and *freestone* groups is not wholly satisfactory, as there is no hard and fast distinction between these two classes. About 300 varieties have been developed by American horticulturists, which may be grouped as follows:

(This classification, compiled by Professor R. H. Price, of the Texas Experiment Station, is accepted as standard in its essential features, and all later classifications are based upon it.)

(1) *Peen-to,* a medium-sized fruit flattened endwise, having a sweet but peculiar flavor; color of skin, white, mottled with red; grown usually in the southern range of the peach area.

(2) *South China*, a small oval fruit, somewhat flattened.

(3) *Spanish*, or *Indian*, a late fruit, generally yellow, with a hairy skin

(4) *North China*, a large, oval fruit

(5) *Persian*, including most of the large yellow- or white-fleshed varieties cultivated in the northern part of the United States.

Among the best-known commercial varieties of the fruit are the Elberta, the most popular peach in America; the Belle of Georgia, and the Crawford. The nectarine (which see) is really a variety of peach, but its smooth skin lacks the downy fuzz characteristic of a true peach.

Culture. Fruit-growers obtain trees for the orchard from nurserymen, who propagate the plant from seeds. As the seeds do not, as a rule, produce plants of their own type, desired varieties are obtained by budding the seedlings, a process explained in these volumes in the article GRAFTING (Bud Grafting). In the coastal regions of the South, trees budded in June are sometimes transplanted to the orchard the following fall, while one-year-old trees are planted in localities farther north. In the Northern states, two-year-old trees are usually selected. It is customary in modern practice to set the trees equal distances apart each way, twenty by twenty feet in the North, and twenty-four by twenty-four in the South.

Peach trees grow to a height of from fifteen to twenty feet, and bear long, slender leaves and lovely, delicate pink blossoms. They begin to bear fruit about the third year after transplanting, but are short-lived, and an orchard, to be continuously profitable, must be frequently replenished. Peaches do best in a well-drained, porous soil, having a mellow-loam texture, and lacking alkali. When supplied with adequate moisture, sandy soils are suitable for peaches, but the fruit never thrives in heavy clay. Peach trees tend to blossom early, and in localities where late frosts are prevalent, it is often necessary to retard budding. Standard practices in commercial culture include whitewashing of young trees to prevent sunburn, pruning of undesirable branches, thinning of surplus fruits, cultivation of the orchard soil, and planting of cover crops. Fertilization of the soil is sometimes necessary to encourage growth.



EFFECT OF BROWN ROT IN PEACHES

Enemies. Of the diseases to which the peach is subject, the *brown rot* is one of the most troublesome. It especially attacks the ripening fruits, producing a typical brown rot, followed by the development of the spores of the fungus in such quantity as to give the fruit a gray, moldy, appearance.

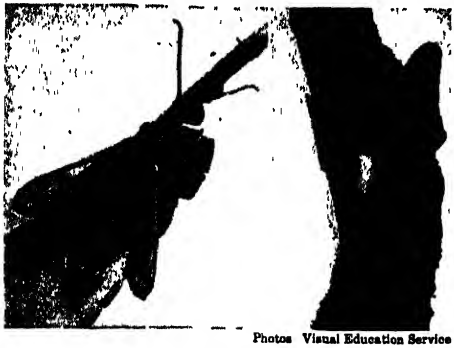
Another serious disease, appearing in early spring only, is *leaf curl*, which if unchecked strips the tree of foliage. The *yellows*, a disease prevalent among peach orchards in the Northern United States, is very difficult to eradicate. The fruit, red-spotted, ripens prematurely; the winter buds develop in the summer or autumn; the foliage gradually yellows; the branches become stunted and put forth sterile shoots, and, finally, the tree decays and dies. Experiment stations of the states furnish information as to spraying and combating these diseases. Among insect enemies of the fruit are the San José scale, the peach borer, the plum curculio, the fruit bark beetle, and the peach moth (described in these volumes under that name).



PEACH-LEAF CURL

Food Value. Because of their tempting appearance and delicious flavor—qualities which are a direct aid to digestion—peaches are a more important food than their composition would indicate. Fresh peaches contain, on an average, 89.4 per cent of water, .7 per cent of protein, .1 per cent of fat, 9.4 per cent of carbohydrates (chiefly sugar), and .4 per cent of

ash. The fuel value is 190 calories (see CALORIE) per pound. Their high proportion of water makes them especially valuable as a



Photos Visual Education Service

AN ENEMY OF THE PEACH
At left, moth of a peach-tree borer; at right, larva of the borer, in its nest on a branch.

laxative food. As is true of most other fruits, their actual nutritive value is increased by canning, preserving, and drying processes. B.M.D.

Botany of the Peach. The peach is a stone fruit, and belongs to the same family as the apple, plum, and pear, *Rosaceae* The tree resembles the almond (which see) in appearance The cultivated varieties of peach are derived from *Prunus persica.*

PEACH MOTH, OR **ORIENTAL PEACH MOTH,** a close relative to the codling moth, or apple worm, first seen in the United States in Washington, D. C., in 1916. It is supposed to have been brought to America in shipments of Japanese flowering cherry trees, and has now spread to all of the fruit sections in the Eastern states. The larvae of the peach moth feed upon tender peach and cherry twigs, the fruit of the peach, and to some extent, on the fruit of the apple. The quince is so seriously injured that bagging the fruit is necessary to protect it from the caterpillars. This insect is regarded as a very serious pest by peach-growers, because the arsenical sprays that are applied to control the plum curculio do not kill the larvae of the peach moth.

The adult is a small, dark, grayish-brown moth, with a wing expanse of two-fifths to three-fifths of an inch. The larva is slightly over one-half inch in length. In habits the insect resembles the well-known codling moth (which see), with the exception that in addition to feeding upon the fruit, the larvae of this insect bore into the tender shoots of peach and cherry trees. There are usually four generations of larvae, the first of which confines itself to the tender twigs; the later generations feed upon the fruit.

The insect passes the winter in a cocoon beneath the bark or in rubbish on the surface of the soil. In Virginia the first moths appear in April. They deposit their eggs upon the foliage. These hatch in three to eight days, while from eight to sixteen days are required for the larval period.

No satisfactory means of preventing damage has been discovered. Thorough cultivation of the orchard during the dormant season, in order to destroy the insects that live in the ground, destruction of all injured fruits, and thorough spraying are the measures recommended. W.J.S.

Scientific Name. The scientific name of the peach moth is *Laspeyresia molesta*; it belongs to the order *Lepidoptera.*

PEACOCK. "Proud as a peacock" is a figure of speech that explains itself. Whoever has seen the male peafowl, that handsomest of the pheasants, raise his tail feathers and spread them into a gorgeous fan, has not only admired the spectacle, but has realized that the bird himself is apparently his chief admirer. The iridescent, greenish-blue neck and breast, and the long tail coverts brilliantly marked with bold, eyelike spots, give the peacock a plumage that is splendidly decorative. The male bird is about as large as the domestic male turkey; the hen is smaller, less vividly colored, and is without the train.

The description above refers to the best-known species, the common peacock, often seen in city parks and on pretentious country estates. Varieties with white plumage are sometimes found in captivity. Common peacocks occur in a wild state in India and Ceylon, where, in the midst of varicolored tropical foliage, the vivid coloration is protective. These birds eat snails, frogs, and insects, as well as grain, juicy grasses, and bulbs, and are often destructive to growing crops. Another species, resembling the common peacock in plumage, but with golden-green neck and breast, is native to Burma, Malaysia, and Java.

Domesticated peacocks are found in all parts of the world. The young do not bear well the changeable weather of temperate climates, and are difficult to rear. The hen makes her nest in some secluded spot on the ground, laying ten or more brownish eggs.

In ancient times, the peacock was carried to all parts of the world as a great treasure. During the reign of Solomon, "once in three years came the navy of Tharshish, bringing gold and silver, ivory, and apes, and peacocks" (*I Kings* x, 22). The peacock is mentioned in the *Bird Play* of Aristophanes, written in Greece in the fifth century B.C., and Pliny speaks of it as common in his day in Rome, where it was considered a great delicacy as a roast, served in its own feathers. See PHEASANT. See illustrations, page 5430. D.L.

Classification. Peacocks belong to the family *Phasianidae* and the genus *Pavo*. The common peacock is *Pavo cristatus*.

PEALE, *peel*, the family name of two distinguished American painters, father and son.

Charles Wilson Peale (1741-1827) is famed for his series of portraits of Revolutionary soldiers and statesmen. He was born in Chesterton, Md., and in his boyhood served as an apprentice to a saddler in Baltimore. His first instruction in painting, slight though it was, he received from the English painter, Hesselius Later he was a pupil of Copley in Boston, and in 1770 he went to London, where he studied



"THAT ROYAL BIRD, WHOSE TAIL'S A DIADEM." (SEE PAGE 5429.)

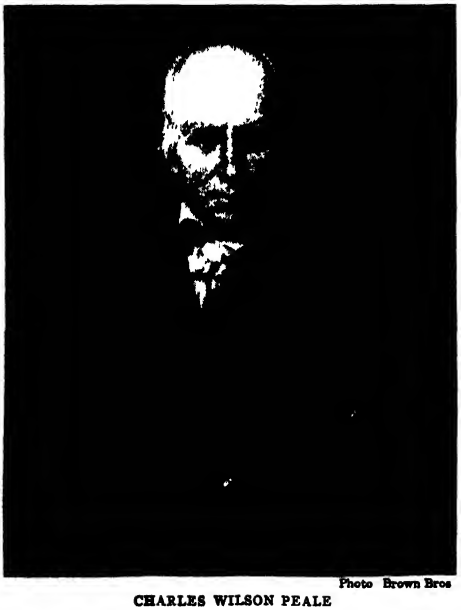


Photo Brown Bros

CHARLES WILSON PEALE

under Benjamin West, returning to America four years later to practice portrait painting at Annapolis Peale was a volunteer in the American Revolutionary War, in which he commanded a company at Trenton and Germantown, and he painted portraits of many prominent officers at odd intervals. Of his fourteen portraits of Washington, the best-known was painted by order of Lafayette for the king of France. During the French Revolution, it was presented to the National Gallery at Washington, D C., where it may now be seen Another is on exhibition in the New York Metropolitan Museum Many of Peale's portraits also adorn Independence Hall, Philadelphia Among other noteworthy paintings are the portraits of Nathanael Greene, Martha Washington, Benjamin Franklin, Thomas Jefferson, Andrew Jackson, Count de Rochambeau, Horatio Gates, and Baron de Kalb

Peale was one of the principal founders of the Pennsylvania Academy of the Fine Arts (1805), the first of its kind in the United States When he was eighty-one years old, he painted *Christ Healing the Sick*, one of his few works outside the field of portraits, two years later, he made a full-length portrait of himself, which now hangs in the Pennsylvania Academy of Fine Arts.

Rembrandt Peale (1778-1860), a son of Charles Wilson Peale, gained renown as a portrait and historical painter. He studied under his father, and

later went to London for instruction from his father's master, West. He spent a great deal of time in Europe, especially in France, where he made portraits of several prominent people. In America he worked in Philadelphia, New York, Charleston, and in Baltimore, where he maintained an art gallery and museum. At the age of seventeen, Peale began a portrait of Washington, from life, and one of the copies of this, executed in 1823, was purchased by the United States government for the National Capitol Peale excelled as a draughtsman, probably because of his French experience, but was less successful as a colorist, in this respect being inferior to his father He was one of the original members of the Academy of Design, New York City, and for a number of years was president of the American Academy of Fine Arts.

His fame rests chiefly on his portraits of noted men of his day, including Gilbert Stuart, Thomas Jefferson, Cuvier, and Houdon In addition to these, other well-known paintings are *The Roman Daughter*, *The Court of Death*, which was exhibited through the country and is probably his best-known work, and *The Ascent of Elijah* Peale was a skilled lithographer, and was interested in fields foreign to his art, especially natural history He was also an author, his books including *An Account of the Skeleton of the Mammoth*, *Notes on Italy*, *Graphics*, and *Reminiscences of Art and Artists*

PEANUT, *pe' nut*, an annual plant of the pea family, which grows like a potato vine, and produces, underground, a nutlike pod, the familiar peanut of our markets Botanically, the peanut is not a nut, but is the fruit of a legume, and is related to the pea and bean, and not to the chestnut or walnut The peanut plant, which is supposed to be native to Brazil, is cultivated in warm regions the world over, in the southern part of the United States, its culture is an industry of importance There are two main types of peanuts grown commercially in the United States, *bunch* and *runner*. The former develop the pod clusters around the main root and grow upright, while the latter form pods on trailing stems. The large-sized nuts for sale in shops come from bunch peanuts; the smaller Spanish and red peanuts are from runner plants.

Peanut Culture. Peanuts are planted in the spring, as soon as all danger from frost is past. They require a sandy soil or sandy loam, limed if acid, and thrive best when the summer is hot and there is moderate rainfall. Two or three of the kernels, with unbroken skins, are planted together one or two inches deep, in hills from nine to sixteen inches apart, and in rows about three feet apart. The earth is finely pulverized for a depth of four or five inches. Above the ground, the plant puts forth a thick, hairy stem with many branches. The flowers, which are small and yellow, and in shape resemble those of the garden pea, grow singly on the vine. After they wither, their stems grow longer and turn downward, forcing their way into the soil. There the familiar pale-yellow pods are developed.

The nuts ripen in October and are harvested before the first frosts appear. First the earth around the plants is loosened, and the vines are pulled up and turned over to dry in the sun for a day. They are then put into shocks and cured from three to four weeks, after which the pods are picked and made ready for shipment. About two bushels of unshelled nuts will plant an acre. Under good conditions, the yield is over forty bushels to the acre, but the average is about thirty-six. Before the nuts are marketed, they are scoured in large metal cylinders, which free them from pieces of dirt and stems, and are then passed through blast fans, in which powerful air currents weed out the imperfect nuts from the sound ones. Candy manufacturers make use of dark and imperfect kernels, so these are not wasted.

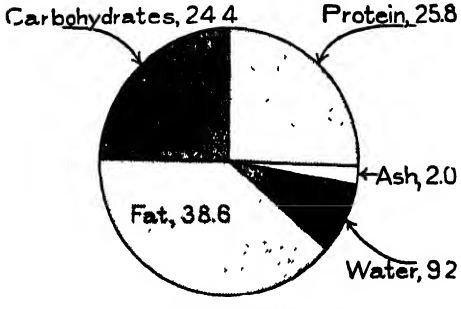


HOW PEANUTS GROW

Uses. Peanut kernels, roasted and salted or used in candy, are everywhere popular. Though peanuts are usually eaten as a confection rather than as a part of the regular diet, they are extremely nutritious (see accompanying chart). Peanuts also contain lime, a bone-building mineral, as well as growth-promoting Vitamin A and nerve-protecting Vitamin B (see VITAMINS). If eaten in moderation, with due regard for the high concentration of nutriment, they are a valuable food. Further-

more, they have no waste tissue and do not readily decay in the intestinal tract. Indigestion from eating peanuts is usually caused by overeating, insufficient mastication, or use of unripe nuts.

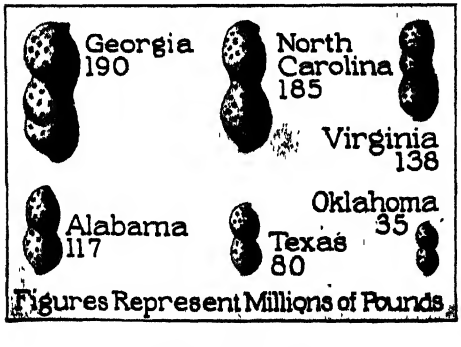
Important manufactured products are peanut oil and peanut butter. The oil is used as a salad dressing, for packing fish, and in the man-



COMPOSITION OF PEANUTS

As a heat producer, the peanut ranks very high; it has a fuel value of 2,560 calories per pound The fuel value of dried peas is but 1,650 calories per pound, and dried beans, 1,560 calories Wheat has about twice as much protein as peanuts, but only about one-seventh as much fat, and a fuel value of 1,625 calories.

ufacture of oleomargarine, and low grades (yielded by third and fourth pressings) are utilized as machinery oil and employed in soap manufacture. The French use peanut oil as a base for their famous Castile soap. The residue from the various pressings, when moistened and baked, forms a cake which is a valued fertilizer and cattle food. A fine meal ground from pea-



PEANUT PRODUCTION

Figures represent the average crop for a period of three years.

nuts is said to be excellent for muffins, when mixed half and half with corn meal. It is also a suitable stock food.

The vines, hulls, and thin skins of a peanut crop are also used as stock food, and peanut hay is regarded as an excellent food for hogs. From a ton to a ton and a half of hay may be secured from an acre. Peanut roots left in the soil enrich it with nitrogen (which see).

Production. From 700,000,000 to 900,000,000 pounds of peanuts are annually produced in the United States. Georgia, Alabama, North Carolina, Virginia, Florida, and Texas are the leading peanut states, the order of the first three being somewhat variable. In the boll-weevil district, the peanut crop is more profitable than cotton. In spite of the large crop produced yearly, the United States imports several million pounds from other countries, chiefly from China. British India, the Sudan, and the Dutch East Indies are other countries having large peanut crops. B.M.D.

Scientific Name. The peanut plant belongs to the family *Leguminosae*. Its botanical name is *Arachis hypogea*.

PEAR, *pair*, a favorite orchard fruit of the rose family, thus being related to the apple, peach, plum, and cherry. Of these it is most like the apple in structure, having a core and seeds in the center instead of a pit. Pears, however, are juicier than apples and, generally speaking, more mellow in taste. A typical pear is irregularly cone-shaped, not round, but there are apples which look like pears, and pears which look like apples. A real distinction is the presence, in the tissue of the pear, of cells containing a hard, woody substance. This is why the pulp of a pear does not feel so smooth, when eaten, as that of an apple.

Distribution and Kinds. The cultivated pears of commerce are derived chiefly from a native European species, *Pyrus communis*. The tree is widely distributed throughout temperate regions, but its cultivation has been most successful in the United States and France. An Oriental species, *P. serotina*, or *sinensis*, which grows wild in Asia and is cultivated in China and Japan, is crossed with the common European pear in the production of hybrids whose fruits are excellent for canning and cooking. The Oriental pear has a hard, gritty, insipid pulp, and the hybrids are also of little value as fresh fruit. Important varieties of the European species include the Bartlett and Bosc; the Kieffer, Le Conte, and Garber are well-known hybrid varieties.

Production. The United States produces from 15,000,000 to 20,000,000 bushels of pears yearly. Among orchard fruits, pears follow apples, peaches, and plums in importance. California is by far the leading pear state, and New York is second, Washington third, and Oregon fourth. Other important pear states (their order varies) are Colorado, Texas, Missouri, Pennsylvania, Ohio, Michigan, New Jersey, Illinois, Delaware, and Maryland. The fruit is produced to some extent in over forty states. The mild climate of the Pacific coast is well adapted to pear culture, and pro-

duction there is increasing. Pear blight and severe winters have tended to reduce the pear crops in the Northern states since 1910.

Culture. Standard varieties of pears are produced by the process of budding on seedlings of the European and Oriental species, while dwarf forms are obtained by use of the quince as stock [see GRAFTING (Bud Grafting)]. These latter grow from twelve to fifteen feet in height and bear earlier than standard varieties, often producing a superior fruit of large size. They are especially adapted to home gardens, as they do not require so much space as tall varieties. Trees of standard varieties do best in a well-drained clay loam, but a light, sandy soil is preferable for hybrids or dwarfs. Standard trees are set twenty to twenty-five feet apart each way, according to size.

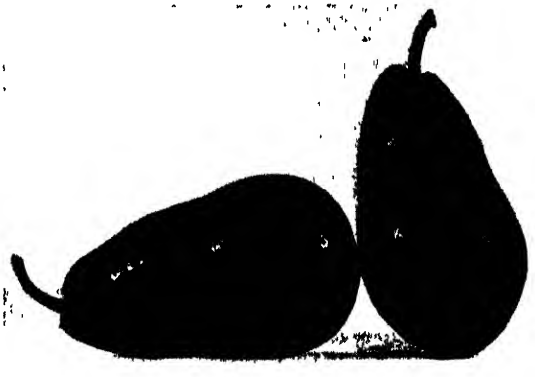


Photo U & U

RIPENED PEARS

The pear orchard requires about the same care as an apple orchard (see APPLE), but precautions must be taken to keep the pear trees from growing too vigorously, since new succulent growth is especially susceptible to *fire blight*. This is a bacterial disease that works its way through the tissues of twigs, leaves, blossoms, and young fruits. When the twigs are killed, the leaves usually remain attached, but are blackened as if scorched by fire. Flowers of bearing trees are also blackened by the blight, and are usually the first parts attacked. When the infections live over winter as wood or twig cankers, a sticky substance oozes from the bark the following spring. Insects, lighting on this material, are supposed to carry the disease to other trees. Fire blight is fought by removal of infected parts and disinfection of the cuts with mercury preparations. Another serious disease, called *pear scab*, spots the fruits. It is controlled by spraying with Bordeaux mixture or lime sulphur.

Pears are picked before they are fully ripe and stored in cool rooms to mature, or packed in barrels or boxes for shipment. They develop a better flavor and are less likely to decay than if allowed to ripen on the trees.

Food Value. Fresh pears have a high percentage of water—84.4 per cent—and contain 14.1 per cent of carbohydrates and small amounts of protein and fat (see articles APPLE, PEACH, PLUM, for comparison of values). They are not only wholesome and laxative, but their juiciness and delightful flavor make them an aid to digestion. Dried pears have a carbohydrate content of 72.9 per cent, and the canned fruit, of 18.0 per cent. Whether eaten fresh, or canned, preserved, baked, or otherwise cooked, pears are perennially a favorite food.

B.M D.

PEARL, *purl*, a small lustrous drop of shelly substance, classed as a gem, but differing entirely from the precious stones in origin. Pearls are not dug out of mines, but are produced by oysters, clams, and other mollusks. Their formation is one of the most interesting facts in nature. The smooth, iridescent lining seen on the inside of a mollusk shell is the secretion of the animal within. It sometimes happens that a grain of sand, the egg of some minute sea animal, or other substance becomes lodged inside the shell, irritating the soft body of the occupant. In order to avoid this irritation of its delicate body, the animal proceeds to cover the object with layers of mother-of-pearl, and in so doing it may produce a gem of great value. The pearl is one of the birthstones for June, the other being the moonstone.

Structure and Characteristics. Pearls are composed of a horny organic substance called *conchiolin*, and two crystalline forms of *calcium carbonate*, with two per cent of water. The solid materials are formed in very thin, light layers that partly transmit and partly reflect light. Many blended reflections produce the beautiful delicate luster that can only be described as *pearly*. Overlapping of successive layers also gives some pearls an exquisite iridescence, or play of colors. The finest pearls are white, creamy, or a delicate rose-pink. Black pearls also occur, and are considered valuable because of their novelty and rarity. The outer surface of a good pearl must be smooth and even; pearl experts often increase the value of a specimen by skilfully peeling one or more top layers until a fine lustrous layer is reached.

In regard to shape, perfectly round pearls are most prized, followed, in order, by those of drop or pear shape, oval-shaped gems, and button shapes. Of less value are irregular



WOMEN DIVING FOR PEARLS

In Japan, where this picture was taken, women are almost exclusively employed to dive for pearls.

pearls known in the trade as *baroque pearls*. Pearls are sold by a special unit of weight called the *pearl grain*, which is slightly lighter than the avoirdupois grain. In general, the value increases as the square of the weight; a fine large pearl costs four times as much as a pearl half its weight. Only the small pearls of cheaper grade are sold straight at so much per grain.

Care of Pearls. Pearls are soft, easily scratched and marred, and are subject to decay and attacks of acid. They do not begin to have the lasting qualities of diamonds. A pearl necklace or other piece of jewelry should be carefully wiped after use and put away in a tightly closed case. Pearls are affected by dust, rubbing, chemicals, perspiration, heat, and moisture A case lined with oiled silk, which will not draw out their water by absorption, is the best container. Dried-out pearls tend to crack and crumble, and heat and moisture aid in the process of decay.

Fisheries. The chief fisheries are off the coast of Ceylon, in the Persian Gulf, among the Polynesian Islands, in the Sulu Archipelago, along the northern and western coasts of Australia, and off the coast of Lower California. The Persian Gulf is particularly famous for its fine pearls, but Australia has become no mean rival in recent years. The pearl oyster lives at a depth of from eight to twenty fathoms, and is found in the greatest numbers in the channels dividing groups of islands, where there is a strong, dredging current. The diver goes to the bottom armed with a net of rope for scooping up the shells. The shells so collected are unloaded from boats on the sand, and allowed to lie until the mollusks have decomposed. They are then washed in sea water, and the hunt for gems begins.

The Mississippi River and its tributaries furnish fresh-water pearls of considerable value, and the mussel shells are much in demand for the making of buttons, knife handles, and other articles of commerce. Muscatine, Ia., is the center of this industry.

Culture Pearls. In 1894 Kokichi Mikimoto, a Japanese, devised and patented an improvement upon a method for producing pearls which the Chinese had used for centuries—the insertion of a foreign substance within an oyster shell, thereby artificially inducing the making of a pearl. The new method requires skilled handling, "planting" the oyster in selected water, and a period of five years or more while the pearly layers are being formed. But the resulting gem, unlike the Chinese "culture" pearls, is perfect, and usually cannot be distinguished from a natural pearl except by the X-ray, which reveals the nucleus.



WOMEN DIVERS RESTING FROM THEIR VERY ARDUOUS WORK
A scene in Japan The divers rest about half of the time—about six times an hour for periods of five minutes

Legally, a culture pearl is the same as a natural gem.

Imitation Pearls. *Orient essence,* or *pearl essence,* a substance made from the scales of certain fish, makes possible the world's enormous "imitation-pearl" industry, for it gives to beads of ordinary glass an authentic pearly luster. This substance, formerly made from a fish found chiefly in Russian waters, is now made from the shad and herring of United States fisheries, in a very careful process which yields the fine, grayish dust of the pearl essence. When the beads are hollow glass, the essence is mixed with gelatin and used to coat the inner surface, after which the bead is filled with wax to give it weight. When a solid glass bead is used, as in the finer imitations, the coating is applied on the outside with an airbrush or by dipping, and the bead is polished. T.B.J.

Related Subjects. The reader is referred in these volumes to the following articles:

Birthstones
Button
Gems
Mollusks
Mother-of-Pearl
Oyster
Persian Gulf

PEARL HARBOR. See HAWAII.

PEARL OF THE ANTILLES, a name applied to Cuba (which see).

PEARL OF THE ORIENT. See CEYLON.

PEARL RIVER. See LOUISIANA (Rivers); MISSISSIPPI (Physical Features).

PEARL SPAR. See DOLOMITE.

PEAR SCAB. See PEAR (Culture).

PEARY, *pe' rie,* ROBERT EDWIN (1856-1920), an American Arctic explorer, the undisputed discoverer of the North Pole. He was born at Cresson, Pa., educated at Bowdoin College, and became a civil engineer in the United States navy. Between 1884 and 1888, he was employed in surveys of the projected Nicaragua Canal, at first as assistant engineer and later as chief. A voyage to Greenland, with a trip into the interior, interested him in Arctic research, and he determined to learn more of the interior of the far north. On his return, in 1886, he interested the Academy of Natural Sciences in his schemes, and in 1891 he set out in charge of an expedition. The most important geographical knowledge gained from his explorations was the fact that Greenland is an island. Other expeditions in 1893-1895, and 1896-1897, resulted in important gains for science, and an account of all the journeys was published in 1898 in *Northward Over the Great Ice.*



Photo Brown Bros
REAR-ADMIRAL PEARY
On April 6, 1909, he reached the most northerly point in the world, from which, in whatever direction he looked, he faced south.

In the same year, Peary set out on a voyage with the avowed intention of discovering the North Pole. He was absent for four years, and while not successful in his main quest, made important discoveries. The northern coast of Greenland was surveyed, and a latitude of 84° 17′ 27″ was reached, the highest till then ever attained in the western hemisphere.

In 1905 Peary set out in the *Roosevelt*, a ship built for the purpose, which he left on the north coast of Grant Land while he pushed on northward with sledges. He reached latitude 87° 6′, thus establishing a new "farthest north" record, but was forced by privations to turn back. *Nearest the Pole*, published in 1907, tells of this journey. A second expedition in the *Roosevelt* was undertaken in 1908. Again the ship was left in Grant Land, while Peary and his companions went on over the ice. One after another of his companions turned back because of a shortage of supplies, and only four Eskimos and one negro servant were with Peary when, on April 6, 1909, he reached the latitude 89° 57′. Though within sight of the Pole, he was too exhausted to go farther, and not until the following day did he reach his goal and make the desired observations. From soundings taken, he proved that the sea about the Pole is not a shallow body of water, as had always been held.

Peary's great news was not accorded the enthusiastic reception due it, because Dr. Frederick A. Cook, another American explorer, had announced one week in advance of Peary's return that he had reached the Pole in April, 1908. Careful scientific investigation, however, proved Dr. Cook's claims to be false and left the fame with Peary. Many honors were conferred upon the successful explorer, who was promoted to the rank of rear admiral and given the thanks of Congress.

He was president of the American Geographical Society from 1901 to 1906 and of the Eighth International Geographical Congress in 1904, was delegate to the International Polar Commission in Rome in 1911, and two years later was made Grand Officer of the French Legion of Honor. In May, 1917, after the declaration by the United States of a state of war with Germany, Peary was made chairman of the National Aerial Patrol Commission, organized under control of the Navy Department. See COOK, FREDERICK A.; POLAR EXPLORATION.

His Writings. Others of Peary's works not mentioned above are *Snowland Folk*, *The North Pole*, and *Secrets of Polar Travel*.

PEASANT, *pez′ ant*, **WAR,** a name given to the rising of the peasants in Central and Southern Germany in 1524-1525, sometimes called the GREAT PEASANT WAR, to distinguish it from other struggles of similar character which preceded it. The cause of these various risings was the desperate condition of the lower classes, who were oppressed in every possible way by their overlords and were allowed practically no rights; but the immediate occasion for the breaking out of the revolt was the Reformation, and the religious aspect was prominent throughout the struggle. The peasants felt certain that Luther would approve of their demands and that with his help they might easily win. But he was determined not to allow the religious movement to become involved with political struggles, and he saw, too, that though the demands of the peasants were for the most part reasonable, their methods of enforcing them were far from moderate. He used his influence, therefore, rather on the other side.

The peasant forces were without leaders or organization; irregular bands gathered and went about pillaging, burning castles and convents, murdering, and committing many other excesses. As soon as they were set upon by a regular army, they were reduced to submission, and the revenge which was taken on them was as frightful as their own earlier cruelties had been. According to authentic accounts, about 100,000 persons were killed in this struggle, and the condition of the peasants afterward was worse than it had been before.

PEAT, *peet*. As stated in these volumes in the article COAL, peat is merely coal in the making. Both are valuable fuels produced by the decay of vegetable matter, and their formation illustrates one of the numerous ways in which nature has made our planet a suitable habitation for mankind. The plants which formed the peat beds of the world grew in bogs where there was standing water, and their development began in ages long past. As these plants branched and intertwined, they formed a thick mat on the surface of the marsh, causing the lower portions of the stems to die. The decaying vegetation sank lower and lower as the surface growth continued, forming a compact mass that would have turned into coal if there had been sufficient heat and pressure. Peat is thus the first stage of coal. Deposits near the surface are usually brown; those farther down are black, as they are more nearly decomposed. The latter form of peat looks like wet, black clay. In the northern hemisphere, the vegetation of the peat bogs consists chiefly of mosses, but rushes and similar aquatic plants formed the deposits of the southern hemisphere. It is supposed that peat forms at the rate of two to four inches a year. See GEOLOGY (Work of Plants and Animals).

Distribution. In Europe there are large peat areas in Russia, Norway, Sweden, France, Germany, Austria, Denmark, Holland, and the British Isles, especially Ireland (see HEATH). In North America there are peat areas in Alaska, Canada, and the United States. Can-

ada is estimated to have 37,000 square miles of workable bogs, the deposits of which are about five feet deep. Alaska peat is an exceptionally good fuel. A recent survey of the peat areas of the United States shows that the deposits represent an aggregate of nearly 13,000,000,000 tons. Deposits are of frequent occurrence in the states of the Atlantic coastal plain from



A PEAT BOG

The illustration shows how peat is cut; the appearance of the field is the same, whether the cutting is by hand or by machinery In the background is shown a pile of peat blocks, ready for drying

New Jersey to Florida, and in the northern tier as far west as North Dakota. The regions mentioned in this paragraph are the chief peat-forming areas of the world.

Uses. To make peat a suitable fuel, it must be drained of its water content, which is sometimes nine-tenths of the weight. The expense and difficulty attending this process have tended to limit its exploitation in America. In Europe, however, peat is burned in the homes of thousands of peasants, and there it has been a common domestic fuel for centuries. Various machines have been made for digging and grinding the raw material, molding it into blocks of desired size, and spreading these out to dry in the air. At best, peat has about two-thirds of the heating value of coal.

Tests are also being made to discover the practicability of using powdered peat as fuel. In the United States there were four peat-fuel plants in operation at the outbreak of the World War, and ten which were selling peat for fertilizing purposes. The number has not increased; it is apparent that the American peat industry is as yet only in the experimental stage. In Canada the Dominion government maintains an experiment station where peat is prepared for fuel, and it is likely that the deposits of the country will some day be utilized on a large commercial scale.

There are various other ways in which this product is utilized. Brown peat, which is light and a good absorbent, is made into an excellent bedding for horses and cattle, and dried, powdered peat mixed with crude molasses is a stock food much used in Europe. Black peat, in which there is considerable nitrogen, is used as a fertilizer, or as a filler for chemical fertilizers. This is the chief use to which peat is put in the United States. When supplied with lime, potash, and phosphorus, peat soils are among the most valuable of all areas for growing truck crops. The fibers obtained from shredding peat prepared for stable litter are now being utilized in making paper, and as stuffing for upholstered furniture and mattresses. Charcoal obtained from compressed peat is valued as a fuel in iron smelting.

PEBRINE, *pa breen'*. See ZOÖLOGY (How Zoölogy Affects Human Welfare).

PECAN, *pe kan'*, or *pe kahn'*, a North American tree of fine proportions, belonging to the hickory genus in the walnut family. The fruit of the pecan tree is a rounded, oblong nut that finds a ready market. Thin-shelled varieties are in greatest favor, as the shells can be con-



PECANS

(*a*) Mobile pecan, showing shell, meat, and cross section (*b*) Halbert pecan, with like illustrations

veniently crushed between the fingers; the sweet, nutritious meats, too, are easily taken out. The pecan tree is native to the states along the Mississippi, from Iowa southward, but it is now cultivated in all the Southern states and in California. In the South, es-

pecially, the raising of pecans is a thriving industry. The owner of a pecan orchard, however, must be content to wait for returns. Though trees begin to bear when five or six years old, no profits can be expected before the end of ten years, and for full returns on his investment, the owner must wait another ten years. A good orchard of twenty acres will produce a crop of over 10,000 pounds of nuts at the end of ten years. Pecan trees have large, thick trunks, from four to six feet in diameter at the base; they grow from 100 to 170 feet in height, but are not valuable as timber trees, because their wood is brittle. B.M.D.

Classification. The pecan belongs to the family *Juglandaceae*. Its botanical name is *Carya illinoensis* or *C pecan*.

PECCARY, *pek' a rie,* one of a group of animals similar to the smaller breeds of wild hogs. There are two main species known—the common *collared peccary*, found in almost



THE COLLARED PECCARY

all parts of South America and extending into the northern continent as far as Texas and Arkansas, and the *white-lipped peccary*, peculiar to Guiana, Brazil, Peru, and Paraguay. The collared peccary is about the size of a young hog, and has a grayish, bristly coat and a narrow strip of white around its neck. The white-lipped is considerably larger, of a darker-gray color, and is characterized by its white mouth and nose. Peccaries differ from domestic swine in being practically tailless, and in the possession of a gland opening on the loins at the back, which secretes an ill-smelling oil and must be removed as soon as the animal is killed, to prevent tainting the flesh. From the musky odor of this oil, peccaries are sometimes called *muskhogs*. Their litter is small, consisting of only two

They are gregarious animals, and the white-lipped often travel in very large herds and do great damage to crops, which they attack at night, for this is the time when they do all their feeding. The common peccaries frequent dense thickets, river bottoms, and swamps, and are found in arid countries among mesquite and cactus. Their food is largely vegetable matter, although they also eat and destroy reptiles, a service which partly compensates for the crops they damage. Small droves of the common peccary often make their homes in the hollows of great trees. They are shy, timid creatures, and flee when in danger, but in the wild state, they defend themselves with their sharp tusks. Their most common enemy is the puma, which will attack a single peccary but hide from a herd. They can be tamed, but their dispositions are not agreeable. Their flesh is inferior to that of the domestic swine, and they are considered of little value as domestic animals. W.N H

Scientific Names. Peccaries belong to the family *Tagassuidae* The scientific name of the collared peccary is *Pecari tajaçu*, or *P. angulatus*. The white-lipped is *Tagassu pecari*.

PECHILI, *pa' che le,* GULF OF. See YELLOW SEA.

PECK. See DENOMINATE NUMBERS (Table of Dry Measure); BUSHEL.

PECK, JAMES. See IMPEACHMENT.

PECOS, *pa' kohs,* **RIVER,** the largest tributary of the Rio Grande, rising near Santa Fe, N M., at the foot of Baldy Peak. Over the greater part of its course of 800 miles it flows southeast, running beside the palisade of Llano Estacado, a great, level plateau in New Mexico and Texas. It joins the Rio Grande in Texas, thirty-six miles north of Del Rio. The river drains an area of more than 32,000 square miles Storage reservoirs have been built near Carlsbad, N. M., to utilize the waters of the Pecos for irrigation (see IRRIGATION). It was during the irrigation work in 1922 that the now famous Carlsbad Cavern was discovered along the Pecos River near Carlsbad. See CARLSBAD CAVERN.

PECTIN, *pek'tin,* a neutral substance (one neither acid nor alkaline) found in most fruits and some vegetables. Belonging to the carbohydrate group of foodstuffs, it has the property of thickening or stiffening a mixture with which it is cooked—it makes jelly "jell." The amount of pectin varies greatly with the ripeness of the fruit, and certain fruits are richer in this substance than others. It is most useful for making jelly from fruits which are lacking in pectin.

Commercial pectins, made by concentrating fruit juices rich in pectin, are being marketed. Some fruit juices "jell" quickly with the addition of but a small amount of pectin, because of the amount of concentration that has taken place. It would be difficult to make a firm jelly from peach and strawberry fruits alone, but with the addition of commercial pectin, excellent results are obtained. Jellies made with pectin are flavored with two juices—the one of the fruit which forms the basis of the



THREE STYLES OF PEDIMENTS
On Carpenter's Hall, Philadelphia; on the Temple of Zeus, at Olympia (central figure); on the Temple at Assus, in Egypt

jelly, and the one from which pectin is made. More sugar is required when the commercial product is utilized, but the amount of jelly obtained is greater. See JELLY.

PECTORAL ARCH. See SKELETON.

PECTORAL MUSCLES. See ARM.

PEDAGOGY, *ped' a go jic.* When the boys in ancient Greece and Rome went to school, they were accompanied by a slave who guided and protected them on the way. Sometimes this slave, called a *pedagogue,* combined the duties of instructor with those of guardian, hence the name *pedagogue* was in olden times given the instructor of youth. From this word, which means *a leader of children,* the term *pedagogy* is derived It originally meant the theory of teaching, but its meaning has been gradually expanded until now the term is synonymous with *science and art of education.*

Experimental Pedagogy. Since the beginning of the present century, the experimental methods in psychology have led to the study of pedagogy along similar lines The chief purposes of these experiments have been to make pedagogy more definite and practical in its applications, and to determine standards of efficiency for children of various ages and in different subjects. Standards in writing, arithmetic, English, composition, and various other branches taught in elementary and secondary schools have been determined by long and careful study of results obtained in different schools A teacher by comparing the work of her pupils in penmanship in the fifth grade, for example, with the standard, can tell how nearly they approach standard The danger is that teachers may overlook the fact that these standards measure the minimum requirements for the grade The influence of personal characteristics, aptitudes, and fatigue upon the work of school children has been carefully noted, and one of the important results of these investigations is seen in the modification of courses of study in some school systems, and of the daily program in others. M.V.O'S.

Related Subjects. Methods of teaching the common branches are given in the respective articles on those branches See ARITHMETIC, GRAMMAR, etc Other closely related subjects are

Attention
Education (Modern Tendencies)
Habit
Imagination
Interest
Memory
Nervous System
Psychology
Reason
Thought
Will

PEDEE, GREAT See SOUTH CAROLINA (Rivers).

PEDERSON, CHRISTIAN, printer of the first Danish Bible. See DENMARK (Literature and Art).

PEDICELS, *ped' ih selz.* See RACEME.

PEDICLE, *ped' ih k'l.* See DEER (Kinds and Characteristics).

PEDIMENT, in architecture, the triangular space on the end of a building having a low, two-pitched roof. It is bounded by the rafters and a line joining their bases, or the cornices. In modern terms, a pediment is a low gable. Pediments are sometimes ornamented with sculpture when used on stone buildings. The finest examples of pediments in the world are those of the ancient Greek Parthenon (which see) at Athens. Probably the best example of a sculptured pediment in North America is that on the front of the central Bank of Montreal. In the Middle Ages, architects decorated doorways, windows, and niches with forms which resemble and are called pediments

PEDOMETER, *pe dom' e tur,* a small instrument resembling a watch, which measures the distance a person has walked. It is carried in the pocket At each step, the motion of the body causes a small lever to move, and this records the number of steps taken. To ascertain the total approximate distance, the walker must find the average length of his step, and multiply. In some instruments, the length of the step is measured, permitting an accurate measurement of a distance covered.

PEDRO, the name of several Portuguese rulers See PORTUGAL (History).

PEDRO II (1825-1891), the last emperor of Brazil, known best as DOM PEDRO, was born in Rio de Janeiro. When the boy was but six years old, his father abdicated in his favor, but Pedro was not crowned until 1841; two years later he married the sister of Ferdinand II, king of the Two Sicilies. In spite of an enlightened reign, revolutionary disturbances were frequent, and trouble threatened constantly with the neighboring states. Through his influence the Amazon River was thrown open in 1867 to the commerce of all nations; in 1871 a law to abolish slavery was passed, but the question continued to be agitated until 1888, when immediate emancipation was proclaimed. Deprived of this valuable personal property and labor supply, rich planters joined the republicans, and a revolution resulted.

On November 15, 1889, a republic was proclaimed, and the emperor was forced to abdicate. He was granted a pension and sent away to Europe on a government vessel; he died in Paris two years later. As a careful student of government and education, he developed into a wise and discreet ruler, always avoiding violation of constitutional provisions. See BRAZIL (History).

PEDUNCLE, *pe dun' k'l.* See RACEME.

PEEKSKILL, N. Y. See NEW YORK (back of map).

PEEL, SIR ROBERT (1788-1850), one of the foremost English statesmen of the first half of the nineteenth century. He was born near Bury, in Lancashire, and educated at Harrow, where he became acquainted with Byron, and at Christ Church, Oxford.

Peel entered Parliament as a Tory when but twenty-one years of age. In the next year he was made Under-Secretary for War and the Colonies, and in 1812, at the unprecedentedly early age of twenty-four, became Chief Secretary for Ireland. In general, he pursued a moderate course in his six years' tenure of this office. He had two particular problems to meet—one, the maintenance of Protestant ascendancy, which he successfully met by ignoring all personal ends and appointing Protestants and Catholics alike; and the other, preservation of order, to accomplish which he established the regular Irish Constabulary, nicknamed the "Peelers." At one time he came into such open conflict with Daniel O'Connell over the Irish question that he sent him a challenge to a duel. Intervention of mutual friends prevented the meeting, however.

Meanwhile, Peel had come to be regarded as an authority on financial affairs, and served in 1819 as chairman of a commission which brought about the resumption of specie payments. In 1822 he became Home Secretary in Lord Liverpool's government, and though he resigned in 1827 when Canning formed a Ministry, he resumed his former office in 1828 under the Duke of Wellington. In 1829 he organized the London police force, whose popular name of "bobbies" was derived from Peel's first name.

When Peel retired from office in 1830, he was regarded as one of the chief opponents of the Reform Bill, which held public attention for the next few years. For a brief period in 1834-1835, he was Prime Minister, but remained chiefly in opposition until 1841, when, as the leader of the Conservatives, he was called upon to form a government. At the opening of his Ministry, he was pledged not to bring about the repeal of the Corn Laws, yet that very measure was the central feature of his administration (see CORN LAWS). A famine in Ireland made conditions there desperate, and Cobden so pressed his Anti-Corn Law agitation that Peel at length exclaimed, "Let them answer him who can; I cannot"; and forthwith set himself to bring about the repeal of the obnoxious laws. In 1846, after repeal was carried, Peel retired, having brought about a revision of the tariff and a revival of the income tax. During Lord Russell's Ministry, Peel was a firm supporter of the free-trade principles which once he had decried; he also lent his aid to an attempt to abolish the political disabilities of the Jews.

Peel had, in the course of his official life, changed his views on most of the great questions brought up for settlement, not because he was vacillating or inconsistent, but because he could not conscientiously refuse to take what he saw clearly were progressive steps. The nation has rarely had a Minister whom it trusted more thoroughly.

PEER AND THE PEERAGE, *peer' aje.* The word *peer* really means *equal,* but as used in England, it refers to members of the *peerage,* or nobility, who are all equal in that each is entitled to a seat in the House of Lords, or Peers, and has a voice in all legislation there enacted. In England the peerage dates from the Norman conquest. Previous to that time, the government was in the hands of a *witenagemot,* or parliament, composed of notable men without titles, who owed their positions entirely to ability and standing.

After the conquest in 1066, the country became practically the property of William I, the Conqueror, who proceeded to portion it out among his followers. The men to whom he distributed land became barons, or direct tenants-in-chief of the king, to whom they were bound to render certain services in return for their lands. Such men were *king's men,* and could be summoned to the king's court to advise and take active part in the government of the country. Included among those who attended the king's court were bishops, abbots, priors, and barons, who were gradually divided into greater and lesser barons, according to their holdings, but all equally barons in that they held their land direct from the king.

The hereditary peerage was of gradual growth, for the grants of land made by William I were not always intended to be passed on from father to son or next heir. However, it became customary, on the death of a baron, to install his son in his place and confirm his position by calling him to the king's court—the origin of the present Parliament. The king held his crown by hereditary right; the peerage assumed the same right and soon established the precedent.

The more powerful of the barons assumed the title of earl, a term which had implied high dignity under the Saxons, and until the reign of Edward III, the peerage consisted only

of earls, barons, and ecclesiastics, the latter representing the Church. In 1337 the Black Prince was created Duke of Cornwall, thus bringing a new title, that of duke, into the peerage. In 1385 Richard II added the title of marquis, previously unknown. Still another addition was made by Henry VI, who created John Beaumont a peer with the title of viscount. Ecclesiastical peers were gradually eliminated, but at the present time, bishops of the established Church of England take seats in the House of Lords as *Spiritual Peers*, their titles not being hereditary.

In 1856 a life peerage was granted Sir James Parke, one of the barons of the exchequer, who was created Baron Wensleydale and a peer "for and during the term of his natural life." It was thought that this life peerage might remove difficulty of expense attached to an hereditary peerage, which is so burdensome that many men otherwise gratified refuse the honor on that ground. This title did not convey the right to a seat and a vote in the House of Lords However, the hereditary right was such an integral part of the peerage that repeated attempts in the second half of the nineteenth century to create peers for life were for the most part unsuccessful.

To further the judicial strength in the Lords, an act was passed in 1876 authorizing the creation of two lords of appeal in ordinary and making provision for the appointment of two more as certain judicial vacancies occurred. Their dignities lasted for life only, and they were to sit and vote in Parliament only so long as they held their judicial offices. Since 1887, all retired lords of appeal may sit and vote as members of the House of Lords for life. The grant of a peerage is made by letters patent issued by the Crown, whose prerogative is limited. The course of descent must be known, and the peerage fixed in some male line according to the custom of primogeniture. The king is not limited as to number of United Kingdom peerages, but the Act of Union of Scotland prevented any increase in the number of Scottish peerages, there being now eighty-seven Scottish peers. Of these, fifty-one hold United Kingdom peerages and have seats in the House of Lords, with sixteen representative Scottish peers, leaving twenty without seats. The Irish peerage has 175 members, of whom twenty-eight are elected to sit in the House of Lords for life, while eighty-two sit as peers of the United Kingdom.



PERSEUS ON PEGASUS
[From the painting by Leighton, now in the Leicester, England, art gallery] See PEGASUS, page 5442.

The Prime Minister usually recommends the creation of new peerages, and by far the greater number of creations for the last two centuries have been rewards for political services. Women may hold peerages either by inheritance or creation. The peerage is now confined to dukes, marquises, earls, viscounts, and barons, given in order of their rank, each title being hereditary and carrying with it certain honors, dignities, and legislative privileges, which, however, can only be exercised in and directly connected with the House of Lords. It is clearly laid down by English laws and customs that the children of peers, although receiving courtesy titles, such as *Lord*, *Viscount*, or *The Honorable*, are yet commoners, and as such are entitled to no privileges not enjoyed by the humblest citizen.

When a peer is accused of misconduct, the right of demanding trial by a body of peers is reserved, and a trial of a peer takes place before the assembled House of Lords.

Peer, in America. In the United States, the word *peer* has no meaning except *equal*. When a man is placed on trial for an offense against the law, he is guaranteed a hearing "before a jury of his peers." In this case, "his peers" is taken to mean a representative jury composed of his fellow citizens

Related Subjects. A more detailed account of the rights and privileges of the various British peers will be found in these volumes in the following articles

Baron	Earl	Parliament
Duke	Marquis	Viscount

PEEWIT. See LAPWING.

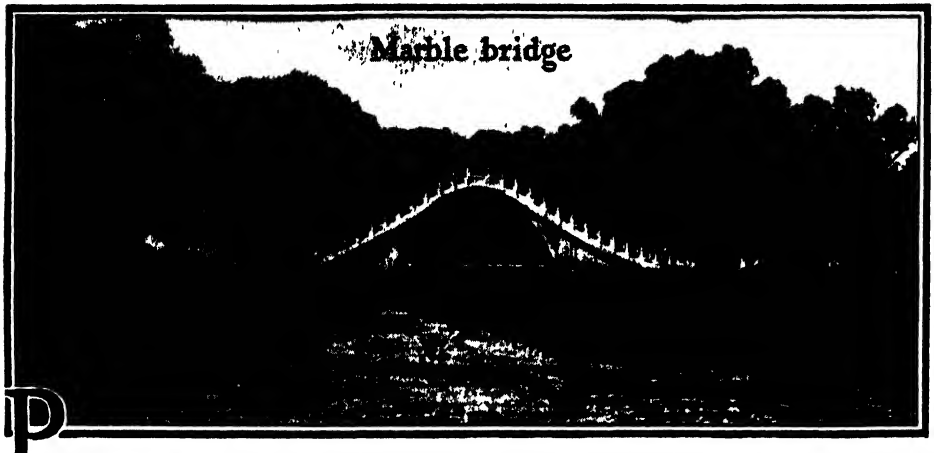
PEGASUS, *peg' ah sus,* a winged steed of ancient Greek mythology. The earliest legend connects his birth with Medusa, the hideous Gorgon whose head was cut off by Perseus. As blood from the head trickled into the earth, it produced the winged horse. Minerva caught and tamed him, according to one story, and brought him bridled to Bellerophon (which see). Another story says that the horse often came to drink at the fountain of Pirene, and here Bellerophon, bearing the golden bridle given him by Minerva, found the animal grazing. At the sight of the bridle, Pegasus yielded himself captive and bore his master away to his successful battle with the Chimaera. After throwing the conceited Bellerophon, who aspired to fly to heaven, Pegasus flew away to the skies and was made the constellation that bears his name (see chart in ASTRONOMY, page 473).

Later legends connect Pegasus with Mount Helicon, which started to rise to heaven when enchanted by the song of the Muses. Pegasus stopped its ascent by a blow of his hoof, and where he struck the ground, there gushed forth the fountain Hippocrene, sacred to the Muses. See illustration, page 5441.

Modern Application. Because of the incident of Hippocrene, this winged steed has become associated with poetic inspiration Thus, when a poet begins to write, it is said that "he mounts his Pegasus."

PEIPING, *ba' ping,* the official name for Peking, China, after 1928. See PEKING.

PEKIN, *pe' kin,* ILL See ILLINOIS (back of map).



PEKING, *pe king'* (often pronounced *pa-king'*). This interesting old city, the capital of China for a thousand years, is one of the largest and most ancient municipalities in the world. When, in June, 1928, the seat of the Nationalist government was moved to Nanking, the government adopted the name PEIPING (pronounced *ba' ping*) for Peking. In these volumes the old name is retained; the new name may lack permanence.

Peking lies in a sandy plain, about twelve miles west of the Pei-ho (White River), 100 miles from the Gulf of Pechili, and seventy miles southeast of the Great Wall of China. Upon first approaching this curious city, one sees nothing but a massive wall cut by sixteen gates, and the outlying suburbs. This outer wall, surmounted by many lofty square towers, varies from thirty to fifty feet in height and is about twenty-five feet thick at its base. It encircles an area of about twenty-five square miles. The top is paved like a roadway, constituting one of the city's most pleasing promenades; from the summit, Peking seems to be a place of gardens.

Few congested districts are visible from this height, and the patterned roofs of the temples, palaces, and mansions, with their blue, green, and yellow tiles, scattered among the groves of trees, afford a pleasing sight. However, the illusion is soon dispelled by the view of decay and dilapidation, poverty and filth, that is very apparent yet in many parts of the great city, as the visitor comes into closer intimacy with the real Peking. However, modern improvements have greatly beautified the place, and in contrast with the Oriental atmosphere there is now seen the spirit of progress; modern innovations appear by the side of medieval conditions.

National highways radiate to the chief cities of the province, and as modern railroad communication has developed, Peking has maintained its place as a center of transportation. Telegraphic and radio communication is maintained with the important centers of the world Great advancement is apparent, too, in civic matters. The Chinese are awakening to the advantages of Occidental civilization. Paved streets, electric lighting, hospitals, and higher

educational institutions are rapidly being made a part of the life of the ancient capital.

Peking is made up of five walled districts, three of which are concentric. The Forbidden City, the old home of the emperor, is in the center, cut off from the rest of the city by a wall and moat. Around it lies the Imperial City, the old home of the lesser members of the court. Outside of this is the North, or Tartar, City, surrounded by a wall forty-one feet high and fifty feet across at the top. The South, or Chinese, City joins the North City on the south, its north wall being the south wall of the North City. The Legation Quarter, the home of official representatives of foreign countries, is a small district in the southern part of the North City.

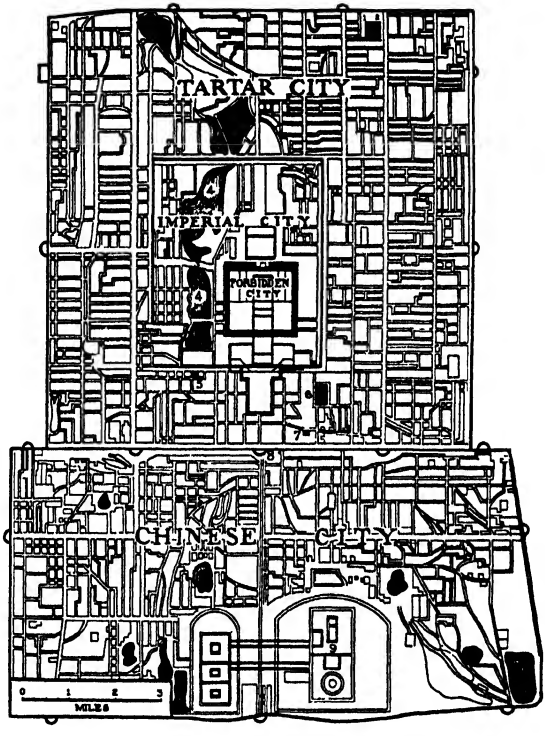


DIAGRAM OF PEKING

(1) Hall of the Classics
(2) Temple of Confucius
(3) Marble Bridge
(4) Lake of Lotus
(5) Mohammedan Mosque
(6) British Legation
(7) American Legation
(8) Chien-men
(9) Temple of Heaven

The Forbidden City. The Forbidden City, surrounded by a deep, wide moat, and enclosed by a wall of bright-yellow tiles, was guarded by many soldiers Foreigners were forbidden entrance, and only Chinese who had official connection with the court might pass the gates. In these sacred precincts is the Hall of Highest Peace, where upon the throne in the spacious hall the emperor held his levees on New Year's Day, his birthday, and on other state occasions. Just beyond is the Palace of Heavenly Purity, the emperor's former dwelling and the most magnificent of all the palaces. The wife of the emperor, "Heaven's Consort," ruled her miniature court in the imperial harem in the Palace of Earth's Repose. Among other notable buildings in the Forbidden City are the Hall of Intense Thought, where sacrifices were offered to Confucius and other sages; the Hall of Distinguished Sovereigns; and the Library, or Hall, of the Literary Abyss, the Guardian Temple of the City. All these former evidences of pomp are now open to the public.

It was within the walls of the Forbidden City that the official ceremonies connected with the raising of the siege of Peking were held in 1900, and it was there that the official celebration of the signing of the Armistice was held in 1919. The first was the mark of the passing of ancient China; the second the rejoicing of the new Republican China over the downfall of militarism and absolutism.

Imperial City. Surrounding the Forbidden City is the Imperial City, oblong in shape, with a gate in each of its four walls. Here stands the Great Temple in which the emperor and the members of the imperial retinue worshiped their ancestors. Opposite is the altar to "the Spirits of the Land and Grain." Near by is Prospect Hill, 150 feet high, crowned with five Buddhist temples It is separated from the Forbidden City by a moat crossed by marble bridges. The western portion of the Imperial City contains a beautiful park, whose chief attraction is an artificial lake where in season the beautiful lotus grows in abundance. The lake is spanned by a wonderful marble bridge. Among fine groves of trees are well-paved walks, leading to other parks adjoining. In this section is to be found the Temple of Great Happiness, dedicated to Yüan Fei, the discoverer of the uses of the silkworm.

Tartar City, or North City. Outside of the Forbidden and Imperial cities, at some distance from them and entirely enclosing them, is a third wall much larger and stronger than those designed to give the entire city protection against any invading force. The land enclosed by this wall, outside of the Imperial City, was set aside for the use of the Manchu Bannermen when the invading Manchu tribes captured Peking in 1643 and put their emperor on the throne as the founder of the Ch'ing



Photo U & U

OUTSIDE A CITY GATE

Dynasty. The conquered Chinese were compelled to move outside the wall. Although this exclusion of the Chinese was not long continued, this section of Peking still is called by many the Tartar City. The Manchus, being soldiers and retainers of the emperor, lived on the bounty of the government and were forbidden to engage in business.

Chinese City, or South City. When the Chinese were forced to leave the Tartar City, they went to another walled district, south of the other three cities. The northern wall of this district is the southern wall of the Tartar City. Here the Chinese established their business and made their living by trade. It is called the Chinese City because for a time it was the exclusive home of the Chinese. Many trades are carried on in the streets, in tents, or in movable shops. Among its important buildings are the Altar of Heaven, with its surrounding temples and shrines; the Temple of Heaven, in which the emperor, at midnight in the winter solstice, once offered sacrifices; and the Temple of Agriculture, near which, each spring, the emperor plowed one or more furrows to inaugurate the opening of the season.

Legation Quarter. Situated north of the south wall of the Tartar City are to be found the residences and offices for the representatives of the foreign countries in Peking, and the barracks for their legation guards. Within the Legation Quarter also are found the foreign banks and many of the foreign business houses. It was in this part of the city that most of the foreigners and many of the Chinese Christians sought refuge during the Boxer uprising of 1900. In order that a place of refuge may be available for foreigners in case of disturbance, the Legation Quarter was surrounded on three sides by a strong loop-holed wall, the fourth side being protected by the high south wall of the Tartar City. To prevent the Legation Quarter from being fired upon again, as it was during the siege of 1900, the foreign nations were given control of the wall where it adjoins the Legation Quarter, and men from the Legation Guards are on constant watch on top of the wall. The administration of the Quarter is entirely in the hands of the diplomatic corps, who pass their own regulations and maintain their own force of Chinese police.

Trade. Commercial and labor guilds, each representing one industry but including all those engaged in that line—employers and employees—are the basis of the commercial life of Peking. Since 1900, chambers of commerce have been organized in many Chinese cities. The influential men and directors of



Photo: O R O C

ENTRANCE TO THE LEGATION QUARTER

Within the walls the foreign diplomats have their offices, and here they live, under guard of soldiers of the powers represented.

the Peking Chamber are all representatives of various guilds, though ordinary merchants are admitted to membership. Although Peking is a large banking center, modern industry has not as yet secured much of a foothold in the city. The manufactures of the city are not significant. Trade, however, is important, for the city is the distributing point for the products of Manchuria, Mongolia, and all Northern China proper.

Education. Peking is the educational center of China, for within its walls are to be found the most important educational institutions of the country—the University of the National Government, the National Teachers' College, and the Higher Technical School. The Renaissance, or New Thought, Movement that has swept the country since 1919 was stimulated by the students and educational leaders of Peking. This is a movement to introduce the literary use of the spoken language rather than the ancient classical mode of expression. It has as its motto: "Save the country through science and democracy." The missions—Roman Catholic, Greek Catholic, and Protestant—have schools of all grades from kindergarten to university, and many are privately controlled. In addition to small libraries in most of the lecture halls, there are five public libraries; the relatively small amount of modern literature is eagerly sought for by thousands of readers.



Photo: U & U

A PORTABLE MOVING-PICTURE ENTERTAINMENT

A Mongolian showman charges the juveniles the equivalent of a penny or two to see a short film.

History. The history of Peking covers more than three thousand years, the records showing that, in 1211 B.C., there was a city on the

site of the present Peking, which is the sixth city built on the same site. In 1264 Kublai Khan (which see) made it his capital and built the present Tartar City. The city was occupied by the Manchu conquerors in 1643. In 1860 it was surrendered to the English and French allies [see CHINA (History of China)], leading to the establishment of the various foreign legations in the Inner City. Until 1928 it had been the capital of China for about one thousand years; in June of that year, Nanking was made its capital by the Nationalist government. Since 1912, when China became a republic, the palaces, temples, and homes of the emperors and the members of their courts have been kept as government property, many of them as museums. The National Assembly and various government boards were housed in large modern buildings when Peking was the capital of the Chinese nation. According to a census taken in 1921 under direction of the Metropolitan Police Administration, Peking has a population of 1,300,000.

PEKINGESE, *pe king eez'* (or *ees*), **DOG,** a toy spaniel of Chinese origin which has become a popular and much valued pet in Western countries. The origin of the breed is lost in antiquity, but it is known that these dogs have been regarded as sacred and kept closely guarded in the palaces of the Chinese rulers for many centuries. In 1860, at the time of the looting of the Summer Palace in Peking, five of the dogs were seized in a part of the garden frequented by the emperor's aunt, and, carried to England, they became the progenitors of the Pekingese of to-day.

The dogs are unusual and attractive in appearance, having a lionlike body and catlike suppleness of movement. A standard dog is described as follows: head with broad skull, flat between the ears, wide between the eyes, nose, black, broad and flat; eyes, large, prominent and lustrous; ears, heart-shaped, set high; muzzle, short and broad, wrinkled; tail, curled gracefully over the back. The coat is long, flat, and silky, with an undercoat like fur and profuse feathering on the thighs, tail, and feet. There is a thick mane extending beyond the shoulder blades. In color the Pekingese may be red, fawn, black, sable, brindle, white, or parti-colored. The largest specimens weigh eighteen pounds; the smallest less than ten. These dogs are hardy under healthful conditions, the one weakness being a tendency to sore eyes. They are affectionate, intelligent, and very faithful. M.J.H.



Photo Wide World

CLOSE VIEW OF A SATISFIED PELICAN

His beak is full of dinner. This bird was photographed in the Longfellow Zoo, in Minneapolis, Minn (See page 5447.)

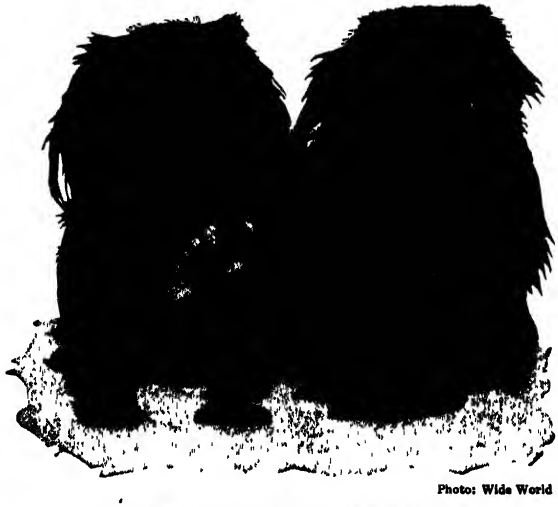


Photo: Wide World

THREE-YEAR-OLD CHAMPION PEKINGESE DOGS

PELAGIC, *pe-laj' ik,* **SEALING.** See SEAL (Fur-Seal Legislation).



Photo U & U

Nature's prime favourites were the Pelicans,
High-fed, long-lived, and sociable and free
—MONTGOMERY: *Pelican Island.*

PELECYPODS, *pe les' ih podz.* See MOLLUSKS.

PELÉE, *pch la',* MONT, a volcano noted for eruptions. See MARTINIQUE.

PELEGRINA PEARL. See GEMS.

PELEUS, *pe' luse,* the father of Achilles (which see). See, also, ERIS; TROY (The Golden Apple).

PELIAS, *pe' lih as.* See MEDEA; JASON; ARGONAUTS.

PELICAN, *pel' i kan.* "A funny old bird is the pelican," runs the familiar limerick, alluding to its ability to "store in its beak food enough for a week." When we realize that the enormous pouch attached to its grotesque-looking bill is capable of holding several quarts of water, this statement does not seem exaggerated. It is not water it stores, however, but small fish which will later be feasted upon leisurely, or fed to its young. Both young and old birds have voracious appetites. A curious sight it is to see a young pelican plunge its head deep into the parent bird's pouch and dig out the partly digested food. In motion pictures we are sometimes enabled to watch this operation. During the feeding process, the pouch is pressed back against the breast, which gave rise to the ancient legend that the pelican fed her young upon her own blood, and led to the use of this bird in heraldry and medieval art as a symbol of charity, mother love, and self-sacrifice. The state seal of Louisiana, nicknamed the *Pelican State,* bears the heraldic device called "The Pelican in Her Piety."

The pelican is the largest of the web-footed birds. The *American white pelican,* which weighs about sixteen pounds, has a length of five feet and a spread of eight to nine across the wings. Its plumage is snowy white, with a tinge of straw color on breast and neck, and with wings partly black. During the breeding season, the male bird develops on its bill a horny, triangular projection. This species was once common during the breeding season in the Mississippi Valley and Canada—particularly around Shoal Lake in Manitoba—and is occasionally seen around the Great Lakes, but in the winter it migrates to the Gulf coast and the marshy lakes of the South. Its nest is built usually on the shores of an island in an inland lake, and consists of a mound of earth, gravel, and sand, roughly topped by twigs; among these twigs are laid from one to four creamy or bluish-white eggs, though most often only two.

The birds are highly sociable, living in colonies and frequently following a cooperative plan in their fishing. The white pelican does not dive for its food, as do most other species, but swims quietly in the shallows, darting its long, hooked bill into the water and then skilfully tossing its prey into the air and transferring it to the elastic pouch. It is a swift swimmer, and is strong and graceful on the wing but extremely awkward on land. It is when the bird is dozing after its gluttonous meal that it is most easily captured, for its drowsiness, added to its heavy body and the load of fish in its pouch, makes it difficult for it to begin flight.

Two others of the ten known species are American—the *California pelican* and, very similar to it, the *brown pelican* of the southern seacoast and the West Indies, which frequently penetrates as far north as the Carolinas. Pelican Island, in Indian Lake, Fla., was set aside by the United States government in 1903 as a pelican refuge, and many of the other bird reserves also harbor great flocks of these curious creatures. See BIRD (Government Protection of Birds). D.L.

Scientific Names. The pelican family is known as *Pelecanidae* The white pelican is *Pelecanus erythrorhynchos*; the California, *P. californicus*, the brown, *P. occidentalis*.

PELICAN STATE, a popular name applied to Louisiana (which see).

PELION, *pe' lih on*, a mountain in Thessaly, Greece, which figures in a celebrated myth. According to the tale, the giants piled Pelion upon Ossa, another mountain, in an attempt to reach Olympus, the home of the gods. Pelion was the abode of Chiron, the Centaur, who lived in a cave near the summit. The *Argo* (see ARGONAUTS) was built from wood taken from Pelion's slopes. The mountain lies between Volo and the east coast, and its highest point is 5,340 feet above the sea.

[A modern phrase, *piling Pelion upon Ossa*, means adding difficulty to difficulty.]

PELLAGRA, *peh lag' rah*, or *peh la' grah*, a non-contagious disease believed to be due to some deficiency in the diet. Pellagra was, or is, prevalent among the poorer classes in Italy, parts of France and Spain, Egypt, and the Southern United States. When first studied, it was noted that a one-sided diet, consisting chiefly of fat meat, devitalized cereals, molasses, and coffee, was commonly associated with its occurrence. The United States Public Health Service has made an extensive study of the disease with reference to the dietary theory (see *Treatment*, below).

Symptoms. The important symptoms of pellagra include lassitude, disinclination to exert oneself, mental depression, pallor, diarrhoea alternating with constipation, indigestion, and nervousness, along with a bright-red skin eruption resembling sunburn, that appears on the face, neck, back of hands, forearms, feet, or other parts of the body. The tongue becomes red and inflamed, and a burning sensation is felt down the gullet. The eruption leaves a thickened, roughened skin. Untreated cases often end in insanity.

Treatment. The investigations of the United States Health Service indicate that the diet of the pellagra victim is deficient in some element found in fresh beef and yeast, and it is surmised that this substance is possibly a vitamin, or a factor in Vitamin B (see VITAMINS). The Health Service workers report that they have cured many cases and also prevented the recurrence of pellagra by administering specified amounts of fresh lean beef and brewers' yeast. It is generally agreed that the substitution of a balanced diet and hygienic conditions for one-sided meals and unhealthful surroundings will prevent pellagra. See LIFE EXTENSION; NUTRITION. W.A.E.

PELOPIDAS, *pe lop' ih das* (? -364 B.C.), a hero of Thebes, associated with Epaminondas. Their united efforts made Boeotia for a time the leading state in Greece. Pelopidas spent his youth in idleness and pleasure, for he had great wealth and was of high family. Driven to Athens in 382 B.C., when the Spartan influence became supreme in Thebes, he laid plans to overthrow the usurpers, and in 379 returned at the head of a determined band, attacked the garrison, and compelled the Spartans to surrender. He then set up a democratic form of government and was for several years at its head. He organized a Sacred Band among the young patriots, and this was of great help to Epaminondas at the Battle of Leuctra in 371 B.C.; the next year, Pelopidas took part in an invasion of the Peloponnesus which resulted favorably for Thebes. He was killed while fighting against Alexander, a despot of Thessaly. See EPAMINONDAS; THEBES.

PELOPONNESIAN, *pel o po ne' shan*, WAR, a contest for supremacy in Greece, waged between Athens and Sparta. During the Age of Pericles, the allies of Athens had become dissatisfied with the heavy tribute exacted for the construction of public buildings in that city, and only waited a chance to free themselves. Sparta, ever jealous of the glory and fame of its rival, made use of every opportunity to increase this dissatisfaction. Finally, in 432 B.C., when Athens aided Corcyra in a quarrel with its mother city, Corinth, Sparta sent Athens a message that it either must let all the Greek cities go free, or must fight. Athens replied that Sparta should first set free its acquisitions in the Peloponnesus, and when Sparta refused, the war began (431 B.C.).

Sparta's plan was to ravage Attica and stir up revolts among Athenian colonies. The peo-

ple of Attica, at the advice of Pericles, took refuge within the Long Walls of their city, while the Athenian fleet and army were sent to ravage the Peloponnesian coasts, and thus they avoided meeting the Spartans in open battle. This plan worked well for Athens until a plague fell upon the city and swept away more than one-fourth of the population. Pericles was among those who died, and there was no one capable of taking his place.

The turning point in the war was the Athenian expedition to Sicily, which ended disastrously for Athens in a great sea fight in the harbor of Syracuse (415 B.C.). Even after this crushing disaster, Athens refused terms of peace that should limit its empire, and strained every nerve to build and man new fleets. But in 405 B.C., the last Athenian fleet was destroyed at Aegospotamos, and in the next year, the city of Athens surrendered.

Related Subjects. The reader is referred in these volumes to the following articles

Greece (History Decline)	Pericles
Peloponnesus	Sparta

PELOPONNESUS, *pel o po ne' sus*, the ancient name of the southern peninsula of Greece. In medieval times the section was called Morea, because of its resemblance to a mulberry leaf (genus *Morus*), and it still bears that name. It is separated from the mainland by the Corinthian and Saronic gulfs, with a connecting link in the narrow Isthmus of Corinth. In ancient days, the Peloponnesus was divided into six districts—Messenia, Argolis, Laconia, Elis, Arcadia, and Achaea. Among these states almost perpetual war was waged until the Roman conquest in 146 B.C. See GREECE (History); PELOPONNESIAN WAR.

Derivation. The name Peloponnesus comes from the Greek *Pelops* and *nesos*, meaning the *island* of *Pelops* In Greek legend, Pelops was the son of Tantalus, king of Phrygia.

PELOPS, *pe' lops*, in Greek mythology, was the son of Tantalus. Tantalus at one time gave a feast to the gods, and served his son Pelops as the chief dish. The gods, however, recognizing what was set before them, declined to eat, and restored Pelops to life. He married Hippodamia, and was the father of Atreus and Thyestes. The Peloponnesus took its name from him. See TANTALUS.

PELVIS, a strong bony cavity lying directly below the abdominal cavity and communicating with it (see ABDOMEN). It holds the organs of excretion and reproduction, and its bony structure serves as a support for the spine and as a source of attachment for many of the large muscles of the back and abdomen. *Pelvis* is the Latin word for *basin*, a term which somewhat aptly describes the shape of this cavity. The front and side walls are formed by the two hip bones, which are so irregular in shape that anatomists have named them the *ossa innominata*, meaning *bones without a name.* In the back is an opening between the hip bones, which is filled in with a triangular bone called the *sacrum*; the sacrum lies below the



THE PELVIS
(1) Sacrum. (2) Iliac crests (3) Cotyloid cavities

lowest vertebra and above the *coccyx*, or tip of the spine. On each side of the pelvis is a socket for the articulation of each of the leg bones. The whole pelvis, thus, is supported upon the two legs. The floor of the pelvis consists of strong muscles and connecting tissue. K A.E.

PEMBERTON, JOHN CLIFFORD (1814-1881), an American military leader, who, though born in Philadelphia, became a Confederate general in the War of Secession. He was graduated at the United States Military Academy at West Point in 1837, entered the Federal army as second lieutenant, served with distinction against the Indians and in the Mexican War, and was commissioned captain in 1850. Pemberton was chief in command during the memorable defense of Vicksburg. Though he defended the city with energy and skill against the Federals under General Grant, he was forced to surrender on July 4, 1863, giving up more than 30,000 men and vast stores of ammunition. He then resigned from the army, and after the war resided in Virginia and in Pennsylvania.

PEMBINA, *pem' bih nah*, **MOUNTAINS.** See NORTH DAKOTA (The Land).

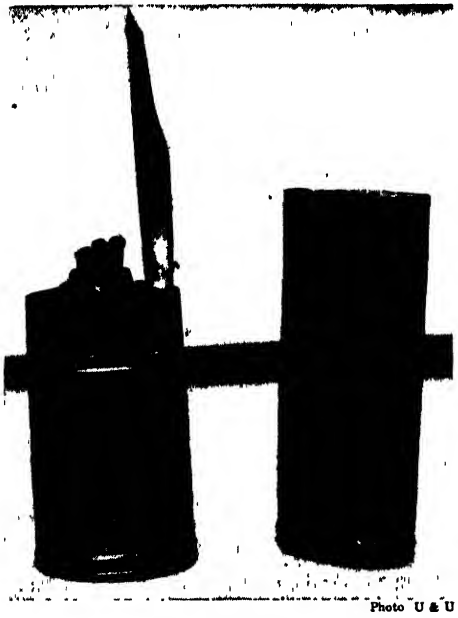
PEMBINA RIVER. See NORTH DAKOTA (Rivers and Lakes).

PEMIGEWASSET RIVER. See MERRIMACK RIVER.

PEMMICAN, *pem' ih kan*, a North American Indian name for a food which contains the greatest quantity of nourishment in the most compact form. Originally, it was prepared by drying and powdering the lean meat of the buffalo or deer. This was then seasoned with berries and stirred into boiling fat, after which it was dried in cakes. Beef is now used in-

stead of buffalo or venison. Since pemmican will keep indefinitely unless reached by moisture, it is serviceable to explorers and those making long expeditions into uninhabited regions. Peary and Cook relied upon it on their Arctic voyages. It is similar to the *tassago* of South America, and the *biltong* of Southern Africa.

PEN. Before the invention of the steel pen, various instruments were used for writing. The Romans used a *stylus*, made of bone or metal and pointed at one end, for engraving characters on tablets of wax. Some people painted letters with a fine brush, as do the Chinese today. Pens made from reeds were used for writing with ink on papyrus (which see); later, it was discovered that better pens could be made from the quills of certain birds, those from the goose, the swan, and the crow being the best for the purpose. Soon after this discovery, quill pens came into general use in Europe, and they were universally employed in America until the advent of the steel pen. The schoolmaster of that day had to know how to mend his pupils' pens, as well as how to teach penmanship. A small pocketknife with a thin, narrow blade designed especially for this purpose formed a necessary part of his equipment. The Latin word for quill was *penna*, or *penne*, and from this we derive the names *pen* and *penknife*. Quill pens were considered satisfactory, but they wore out quickly, and pens of a more durable material were needed.



AN OLD POCKET PEN

A quill pen and ink, about two hundred years old, it offered the first suggestion for the fountain pen.

Steel Pens. We do not know who invented the steel pen, but its manufacture by machinery was begun in England some time between 1820 and 1830. The leaders in the enterprise were John Mitchell, Joseph Gillott, and Josiah Mason. From this beginning, the manufacture of Gillott pens, now known all over the world, was developed. England held the lead in the manufacture of steel pens until recently; America has now passed all other countries in pen-making.

The making of a steel pen is explained below, and nearly all the work is done by machinery. Cast steel of the best quality is used; it reaches the manufacturer in the form of thin sheets about six feet long and seventeen inches wide. The plates are cut into strips which are placed in air-tight boxes and heated to a dull red, then allowed to cool slowly. These strips are then rolled to the required thickness, a process requiring great skill, since a variation in thickness of even one-thousandth of an inch renders the strip worthless.

Pens called *blanks* are cut from these strips with dies. The hole at the base of the nib, and the lateral slits, are then cut with another die, and the name of the factory and other lettering are stamped on the blank. The pens are still flat, and work on them has made the steel so hard that another heating becomes necessary After this second heating, the pens are rounded into shape in a press. Tempering is done by heating the pens to a bright red and immersing them in oil, then rolling them in cylinders over a charcoal fire. The pens are polished by rolling them for several hours in a barrel of ground iron, and then in another of sawdust. When this operation is completed, the pens are of a bright color, resembling polished steel. The points are then ground to make them write smoothly, and then the slit is cut in the point. This is the last and most delicate operation. The edges of the slit are polished by rolling the pens for several hours with powdered iron. Pens having a brown color are bronzed to protect them from the ink, which corrodes steel. The world's annual output of steel pens is estimated to be from ten to twelve million gross (a gross being twelve dozen).

Other Varieties of Pens. Gold pens, which are made in much the same way as steel pens, are valued especially because of their durability and flexibility. The expense of manufacture has been lessened by the substitution of iridium for diamonds and rubies in making tips for the points. Such tips are a protection against wearing on the points. Gold pens are used exclusively in fountain pens, which have in the holder an ink barrel that feeds the point automatically. The stylographic pen is a variety of fountain pen in which a needle at the end serves as a valve to release the ink when the point is pressed on the paper.

PENANCE. See ROMAN CATHOLIC CHURCH (Doctrines and Sacraments).

PENANG, *pe nang'.* See STRAITS SETTLEMENT.

PENATES, *pe na' teez.* See LARES AND PENATES.

PENCE. See PENNY.

PENCIL, *pen' sil.* A piece of lead when drawn across paper leaves a dark-gray mark.



Photos U & U

MAKING FOUNTAIN PENS

At top, slitting the barrel to provide for the shifter Center, polishing caps and barrels Below, putting the point on a pen (See page 5450)

The ancient Egyptians discovered that lead would mark on papyrus (which see), and they used it for such purpose many centuries ago. The Romans also knew of this peculiarity of lead, and they made small rods of it which they used for marking and writing. Then a substance that made a blacker mark was found, and it was called black lead. This substance was *graphite* (which see), and for a long time it has been used for the "leads" in so-called lead pencils, which contain no lead whatever. It is interesting, too, that rubber was originally so called because it was used at first to erase pencil marks.

How Manufactured. The lead pencil of commerce consists of a tiny rod of graphite mixed with pipe clay and enclosed in a wooden case. When received at the pencil factory, the graphite is ground and separated, according to its degrees of fineness, by being floated in water in a series of tanks, so arranged that the water flows from the top of one tank to the next below it. The coarsest settles in the first tank, the next grade in the second, and so on until the last tank, which contains the finest grade, is reached.

The several grades of graphite are used in pencils of varying fineness. The powdered graphite is mixed with ground pipe clay, the proportions depending upon the degree of hardness required in the pencil. Equal parts of clay and graphite make a hard pencil. An



Photos: Faber

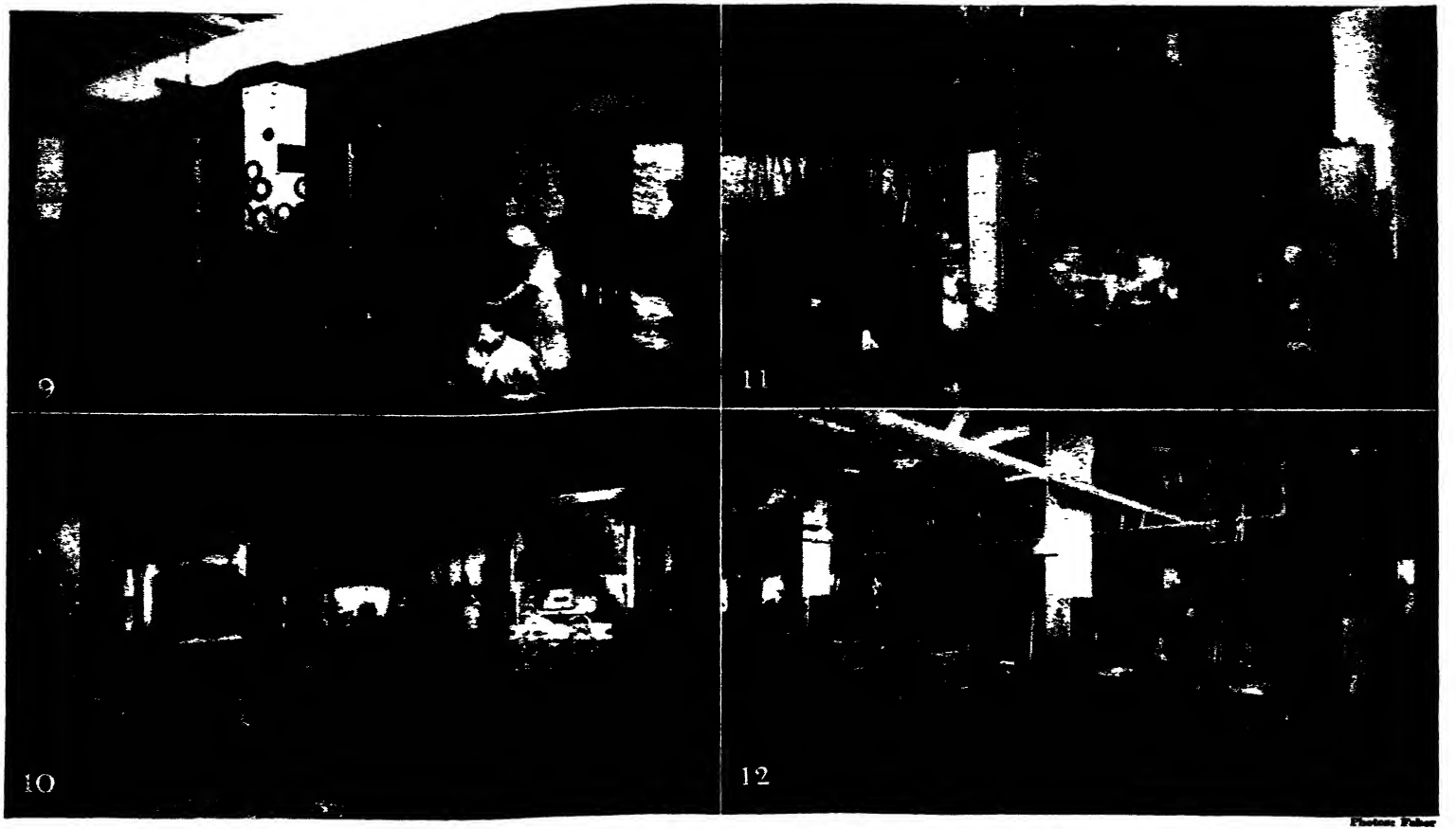
How Pencils Are Made. (I) (1) Pencil slats, slightly longer than a pencil and the width of six pencils, on the way to the drying kiln. (2) Passing slats through cutters, where six grooves are made; into these grooves the leads are eventually laid. (3) The slats are half-rounded and sandpapered, to obtain smoothness. (4) Automatic varnishing machines, some fine grades of pencils receive twenty coatings.

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Photos: Fisher

How Pencils Are Made. (II) (5) Drying racks, where pencil cases are placed between the applications of color. (6) Branding pencils, in gold, aluminum, or powder, in automatic machines by means of heated dies. (7) Last step in dressing, labeling, and boxing. (8) Mixing "lead," which consists of graphite and clay—the more clay, the harder the pencil.



Photos: Faber

How Pencils Are Made. (III) (9) The "lead" in mass is put into presses and forced through dies which shape the leads. (10) The leads are dried in long lengths, then cut to pencil lengths, and "fired," which causes the clay to vitrify, giving the lead toughness. (11) Making the metal caps which are to hold the rubber tips. (12) Minor operations, which make accessories—point protectors, metal caps, mechanical metal pencils, etc.

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ordinary pencil has seven parts clay to ten parts graphite. A soft pencil has a still larger proportion of graphite. The clay and graphite are ground together until they are thoroughly mixed and the mixture has the consistency of dough. It is then put into an iron cylinder, whose lower end is perforated with holes of the size required for the leads. An iron piston, pressed down upon the mass by means of a screw, forces it out through these holes, forming the leads, which are coiled, like wire, on a table. The leads while yet soft are immediately straightened and cut into lengths suitable for two pencils. They are then thoroughly dried and are ready for the cases.

The cases of the poorest grades of pencils are made of pine; those of the best grade are made of red cedar and redwood. Most of the work on the cases is done at the lumber mill. They are sent to the manufacturer in the shape of blocks, each block being large enough for six pencils. In each block grooves are made for the leads. The grooved face of one of the blocks is coated with glue, the leads are laid in the grooves, and another grooved block is placed on the first. Quantities of these blocks are placed in a press and left under great pressure to dry. When taken from the press, the ends of the blocks are finished; then they are run through a machine with rapidly revolving knives which cut them into pencils. Pencils of the highest grades are stained and varnished, and stamped with the name of the maker and a number or letter indicating the degree of hardness. All the work is done by machinery.

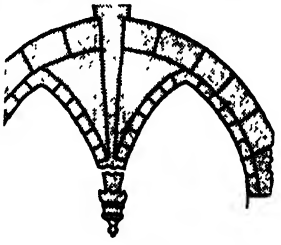
Owing to the increasing scarcity of cedar, a new kind of casing made of paper has come into vogue. The paper is in long, narrow strips and is wound spirally around the lead.

The leading countries in the manufacture of lead pencils are Germany, England, and the United States. All the great pencil factories in America are located in the vicinity of New York City.

Other Pencils. Slate pencils are made of soft slate and may be incased in wood, but most of them are small rods of slate. Colored pencils are made by mixing coloring matter with clay or wax and enclosing the pencil in a wooden or a paper case. Pencils for marking on crockery or glass are made of wax, colored with lampblack or ivory black.

Pencils with a case of metal or bakelite and a means for propelling the lead have come into wide use. They have the advantage of retaining a good point without having to be sharpened.

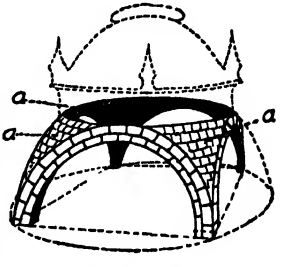
PENDANT, in architecture, an ornament hanging from the ceiling or the pillar of a building. Pendants usually hang from vaults or domes, but in wooden buildings, they may hang from the rafters or girders. In some buildings having the roof supported by arches, they hang from the arches (see illustration). Pendants formed a special feature of ancient Oriental architecture, especially that of the Indians, Persians, and Saracens, who made them of stone and gave them considerable ornamentation. They were introduced into Europe in the Middle Ages, and fine examples are found in the cathedrals and chapels dating from that period. The pendant is but little used in modern architecture.



A PENDANT

PENDENTE LITE, *pen den' te li' te.* See ALIMONY.

PENDENTIVE, *pen den' tiv.* Cut an orange crosswise through the center and remove the pulp from one of the halves, taking care not to break the peel. Cut a section from the part of the peel that forms the top when the rim of the peel rests on the table. Mount the part remaining after cutting off the top on four vertical standards, so placed that they will form the corners of a square Run two threads from the top of each standard to the circle at the top of the orange peel, so placing them as to divide this circle into four equal parts. The triangular segments of the orange peel marked off by these threads represent what in architecture is called a *pendentive.* That is, a pendentive is the triangular segment of a hemispherical dome, formed by arches extending from the four pillars upon which the dome rests to the circumference of the circle formed by cutting off, as it were, the top of the dome. From this smaller circle as a foundation, a second and smaller dome rises. The pendentive is one of the chief characteristics of Byzantine architecture, and the finest example of it is in the famous Mehmedie Mosque in the city of Constantinople (formerly the Saint Sophia Mosque). See MEHMEDIE MOSQUE.



PENDENTIVES

(*a*) Pendentive. Dotted lines show completion of superstructure.

PENDLETON CIVIL SERVICE ACT. See ARTHUR, CHESTER ALAN (Administration); CIVIL SERVICE.

PENDULUM, a weight so suspended as to swing freely in response to the pull of gravity. A bit of metal, suspended from a fixed point by a string and allowed to vibrate, will illustrate the principle. When Galileo timed the movements of a swinging lamp by his pulse beats and noted that the vibrations were made in equal time, he discovered a fact of great practical value, which resulted later in the making of clocks.

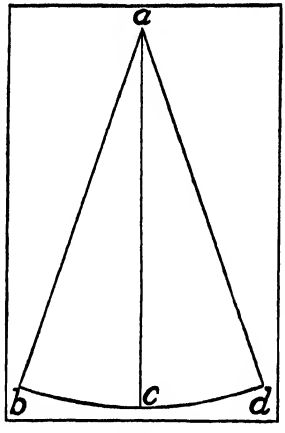


FIG. 1

The movements of the pendulum to and fro are called *vibrations*, or *oscillations*, and the path it traverses is called the *arc*. The time occupied in passing over this arc is the *period*, or *time*, of vibration or oscillation. In Fig. 1, the motion of the pendulum from *c* to *b* or from *c* to *d* and back again to *c* is a *single vibration*; the motion from *c* to *b*, across to *d*, and then back again to *c* is a *double vibration*. The *amplitude* is the arc *b c* or *c d*, or the angle *b a c* or *c a d*. Since the pull of gravity is greater at sea level and high latitudes (the acceleration of gravity increases from the equator toward the poles, and decreases from sea level upward), pendulums vary as to time of vibration according to locality. A pendulum about 39.1 inches long will vibrate once each second in the latitude of New York. The shorter the pendulum, the more frequent are the vibrations, if the amplitude remains the same.

There are four laws of the pendulum, stated as follows:

(1) The time of vibration is independent of the mass.

(2) In the same pendulum, all vibrations of small amplitude are made in the same time.

(3) The time of vibration varies directly as the square root of the length. A pendulum one-ninth the length of another will vibrate three times as fast.

(4) The time of vibration varies inversely as the square root of the acceleration, or force of gravity.

In general, the time of vibration decreases as the pendulum is moved from the equator toward either pole.

The simple, or ideal, pendulum, a weight suspended from a thread (shown in *a*, Fig. 2), could not be used for a clock, because the thread would not be stiff enough to set in motion other portions of the mechanism. A practical pendulum, therefore, is usually of the form shown in *b*, Fig. 2; it consists of a flattened bob supported by a rod, with a screw beneath the bob to adjust the length of the pendulum. The pendulum is lengthened when the clock runs too fast, and shortened when it runs too slow.

Since the rod in a clock pendulum tends to expand in summer and shorten in winter, clocks known as *regulators* are supplied with so-called *gridiron* pendulums, consisting of several brass and steel rods so attached that some expand upward and some downward, thus keeping the mean length constant (see *c*, Fig. 2). In another device, the length is kept constant by the expansion and contraction of mercury in a cup which swings at the end of the rod, in place of the ordinary weight. See CLOCK. A.L.F.

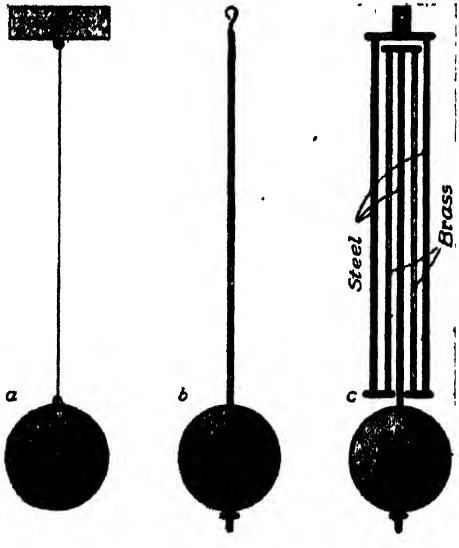


FIG 2

Problems. The following formula is a mathematical expression for the motion of a pendulum:

$$t = \pi \sqrt{\frac{l}{g}}$$

when t = period of a single vibration, l = length of a simple pendulum, $\pi = 3.1416$ (the ratio of the circumference of a circle to its diameter), and g = acceleration of gravity. The average value of $g = 32.2$ feet-per-second per second, or 980 centimeters-per-second per second

1. What is the period of vibration of a pendulum 9.8 centimeters long?

SOLUTION

$l = 9.8$, $g = 980$, $\pi = 3.1416$. Find t.

$$t = 3.1416 \sqrt{\frac{9.8}{980}} = 3.1416 \sqrt{\frac{1}{100}} = 3.1416 \times \frac{1}{10} = .31416.$$

The pendulum vibrates once in about $\frac{1}{3}$ second.

2. At a place where g is 32 feet-per-second per second, what is the length of a pendulum that vibrates in 2 seconds?

SOLUTION

$t=2$, $g=32$, $\pi=3.1416$. Find l.

$2=3.1416\sqrt{\frac{l}{32}}$. Squaring both sides of the equation, we have $4=9.87\times\frac{l}{32}$

Then $9.87\ l=128$, and $l=12.97$ (approximately), number of feet.

3. What would be the acceleration of gravity if a pendulum 100 centimeters long had a period of vibration of 1 second?

SOLUTION

$t=1$, $l=100$, $\pi=3.1416$. Find g.

$1=3.1416\sqrt{\frac{100}{g}}$. Squaring, we have $1=9.87\times\frac{100}{g}$.

Therefore $g=987$. The acceleration of gravity is 987 centimeters-per-second per second

PENELOPE, *pe nel' o pe,* a Grecian princess who, according to the old legend, became the wife of Ulysses about the same time that Helen, her cousin, was married to Menelaus. Ulysses left Penelope soon after the birth of their son Telemachus, to go with the Greeks to the Trojan War. For twenty years he did not return, and during this long absence, Penelope was persecuted by aspiring and persistent suitors, who endeavored to convince her that the long absence of her husband meant his death. She succeeded in keeping them at a distance and in deferring her decision, telling them that as soon as she had completed a web which she was weaving, she would give them an answer; but each night she unraveled what she had woven during the day. After a time, however, she was detected in this scheme and driven to make a decision. Accordingly, she promised to marry him who could bend and use successfully the massive bow of Ulysses. All tried and failed excepting a beggar who had come into the hall among the spectators. This man succeeded with little apparent effort, and was then recognized as Ulysses himself, who had just returned to his kingdom. The hero then turned his arrows upon the troublesome suitors and slew them one after another.

Related Subjects. The reader is referred in these volumes to the following articles.

Helen of Troy — Odyssey
Menelaus — Troy
Ulysses

PENEUS, *pe ne' us.* See DAPHNE.

PENEUS RIVER. See AUGEAN STABLES.

PENGUIN, *pen' gwin.* In the Antarctic regions are found the penguins, a group of birds so unusual in appearance and habits that several expeditions have been fitted out by scientists to study them. Some remarkable moving pictures of these extraordinary birds were secured by the Amundsen expedition. Penguins show a grotesque resemblance to little fat men in dress suits. They stand upright on their short legs, and the gray and white plumage of their ducklike bodies, and their short flipper-like wings, which look like arms, help to carry out the illusion. In the sea, however, where they are quite at home, they are marvelous swimmers and divers, catching fish under water with ease. For life in the water, they have developed special adaptations, their wings being used as paddles and their feet as propellers.

On land the birds are handicapped. Their legs are placed so far back on their bodies that penguins have a ludicrous, waddling walk, and the shortness of the legs makes them poor runners. Some species crawl over the ground, using the wings as forefeet. All are flightless, having lost the art of flight or never having acquired it. These birds come to land to breed and rear their young, and are found mainly on small, rocky islands in far southern latitudes, though some species frequent regions as far north as New Zealand, Brazil, and the Cape of Good Hope. Penguins live in colonies. On their nesting grounds they are so greatly crowded there is barely space for their nests. Sometimes the eggs are laid in crude nests of sticks, stones, and grass; sometimes in pebble nests on the bare rocks. In one species, the female lays and incubates her egg while nesting on solid ice, keeping the egg between her feet and abdomen. Usually, but one egg is laid.

The male shares with the female in the work of hatching and rearing the young, which need protection for many weeks. Though the penguins live in cold regions and seek their food in icy waters, they do not suffer from the low temperature, as they are kept warm by a layer of fat under the skin. On the breast the plumage is soft and silvery, and the furriers use these feathers in making muffs and collars.

It is difficult to keep penguins in captivity in northern climates because they are subject to bronchitis during the winter months. In the New York Aquarium, a penguin suffering from bronchitis was cured by means of the application of ordinary cough medicine and benzoin fumes.

The largest penguin is the *emperor,* about three and one-half feet in height. Scarcely smaller is the *king penguin,* a closely related species. The most widely distributed is the *Adelie.* On the Macquarie Islands, south of Tasmania, are found the *royal penguins,* the great colonies of which are exploited for their oil by sealers. A species now extinct was six feet in height. See illustration, page 5458. D.L.

Penguin Island, by Anatole France, is a satire on human conventions, inspired by the appearance and habits of these birds.



Scientific Names. Penguins belong to the family *Spheniscidae*. The emperor penguin is *Aptenodytes fosteri*; the king, *A patagonica*. The Adelie is *Pygoscelis adeliae*; the royal, *Catarrhactes schlegeli*.

PENINSULA, *pen in' su lah,* any land area nearly surrounded by water. Connection with the mainland, or continental mass, may be by an isthmus, but this is not necessarily the case. For example, the Iberian peninsula, which comprises Spain and Portugal, joins bluntly on to the south of France; and Italy, another important peninsula, is largest where it joins the continental mass; in each instance the point of juncture is too wide to be called an isthmus. A particularly good example of an isthmus connecting a peninsula with the mainland is that of the Isthmus of Perekop, a very narrow strip between the Crimea and Russia proper. See ISTHMUS. R.H.W.

PENINSULAR WAR, a struggle between Napoleon and Spain from 1807 to 1814. See PORTUGAL (History); BONAPARTE, NAPOLEON; WELLINGTON, ARTHUR WELLESLEY; SPAIN.



Photo Herbert

IN PENGUINLAND

A morning stroll in the sunlight on the rim of their private bath, the Antarctic seas. Below, the aristocrat of them all, the emperor penguin. (See page 5457.)

PENINSULA STATE, one of the popular names of Florida (which see).

PENITENTIARY. See PRISON.

PENMANSHIP. The ability to write legibly and with a fair degree of speed is desirable for both social and vocational purposes. Typewriters and adding machines have not supplanted longhand writing. Penmanship is still important in the preparation for a business career. However, it is not necessary that the handwriting match the perfection of copperplate engraving in order to serve all practical purposes. A reasonable standard of legibility is the great thing to be desired.

In order to determine what constitutes a suitable degree of attainment, a measuring scale for handwriting has been devised. [See EDUCATION (Measuring Results of Education).] It is generally agreed that a quality equal to 60 on the Ayres scale is adequate for social and business uses. It is possible for anyone to achieve this standard unless he is handicapped by some physical defect.

The public schools give instruction in penmanship that is designed to make satisfactory penmen of the pupils by the time they have completed the sixth grade, but many boys and girls by force of circumstances are obliged to leave school before they have become good writers. In order to help those who wish to improve their handwriting, the following outline of the fundamental processes is given. As in other matters which pertain to the development of skill, continued practice in these processes is as important as the understanding of them.



POSITIONS AT DESK

(1) Correct posture (2) Incorrect position (3) Desk not fitted to use by this large boy, hence he assumes an incorrect posture

Underlying Principles. Including capitals, small letters, and figures, there are sixty-one characters that one must learn to make. Even were each character entirely different from the others, the task would not be so very difficult, but it is in fact quite simple. All these characters are formed by the combination of two simple elements—the straight line and the oval. Sufficient practice in making and combining these elements will enable one to become a good penman, provided the practice proceeds systematically, with the following points in view:

1. **Form.** Writing is a form study, and anyone seeking to become a good penman should have a clear mental image of the characters he is to make. A study of good script is therefore one essential to successful practice. Any good series of copy books will furnish this material.

2. **Freedom.** By freedom is meant that facility of movement which will enable one to write freely, legibly, and with a good degree of rapidity, without thinking of the characters he is making. When this stage of development is reached, one need not give further special attention to his penmanship.

Directions. Freedom is gained through practice, but the practice must be of the right kind. No one will become a good writer by merely copying the forms of letters and figures. Such training of the muscles employed in writing as will give control over the movements of the hand and arm in the formation of these characters is the foundation of all good penmanship. It is therefore essential that one desiring to improve his penmanship should make a right beginning.

1. **Position.** Sit squarely in front of the desk and turn the paper so that the front edge will form an angle of about forty-five degrees with the edge of the desk. Sit fairly erect, with both feet on the floor.

2. **Holding the Pen.** Fig 1 shows the correct method of holding the pen. The penholder should point to the shoulder, and the forearm should rest upon the muscles between the wrist and the elbow. The tips of the third and fourth fingers should rest lightly on the paper.



POSITION OF HAND
(Fig 1)

3 **First Set of Exercises.** Remember that all practice is for the purpose of gaining freedom and accuracy of movement. With the pen in hand, but without ink, slide the hand over the paper from left to right and back, allowing the third and fourth fingers to rest lightly upon the paper Dip the pen in ink and make lines like those in Fig 2. This movement should be made entirely by the arm

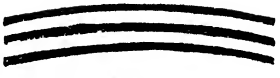


FIG 2
This exercise should extend in one broad sweep across the sheet. Paper that has already been written on may be used, as a matter of economy.



FIG 3
Write first the height of two entire lines on the paper, then the height of one line.

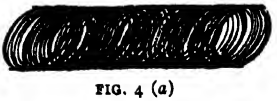


FIG. 4 (*a*)
Write in space of two lines, then in space of one line.

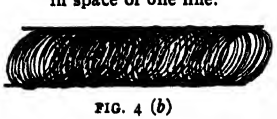


FIG. 4 (*b*)
To be written both in double space and in single space.

The second exercise consists in what is sometimes called the "push and pull" movement, and results in slanting straight lines, as shown in Fig. 3.

The third exercise is a combination of the first and second in the making of the oval, as illustrated in Figs 4.

These exercises all require large movements, because the correct movement is acquired much more

easily by beginning in this way. Continued practice will enable one to bring these movements down to the space required for legible and rapid writing.

4. Second Set of Exercises. The first exercises constitute the first step toward the desired end.



FIG. 5

The next step consists in combining these movements, as in the formation of the oval (Fig 5). After covering a page or two with ovals made by the direct movement, make a page of ovals by reversing the movements, letting the downward stroke form the right side of the character.



FIG. 6

Draw pen entirely across page for first practice, then shorten the strokes

Resort again to the sliding movement from left to right and back, but form straight lines instead of curves This is more difficult than the first exercise See Fig. 6.

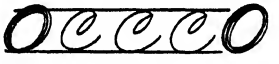


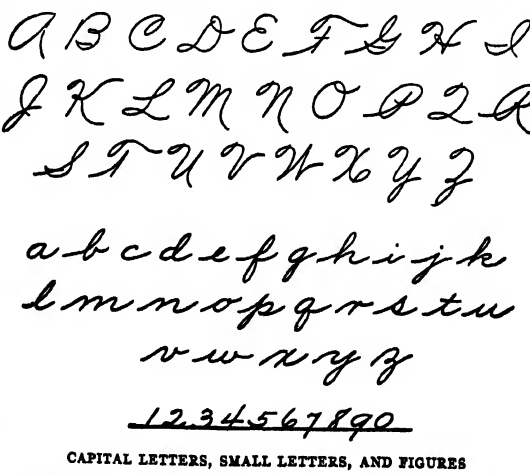
FIG. 7

5. Third Set of Exercises. The third step consists in combining the movements already



FIG. 8

practiced, beginning the formation of letters Fig 7 shows how the *C* is formed from the oval. The small loop should be made with the finger movement In Fig 8, the oval is transformed into the *E* *A* is a combination of the oval and the straight line (Fig 9). The loop and the oval are the basis of capital *S* (Fig. 10).



CAPITAL LETTERS, SMALL LETTERS, AND FIGURES

Enough illustrations have been given to show one how to train oneself in penmanship. The same movements and principles apply to the formation of both capitals and small letters. It is a good plan to practice each exercise for a few minutes every day, since this gives the muscles daily training. Such a plan will lead to more rapid advancement than will longer periods devoted to the work once or twice a week. E.U.G.



FIG. 9



FIG. 10

PENN, WILLIAM (1644-1718), the founder of Pennsylvania and one of the best-known members of the Quaker sect. Penn was born in London, October 14, 1644, the son of an English admiral who was to gain fame and a fortune in the service of Charles II. During the boy's early years, the father was away at sea so much that he had no part in shaping his son's religious training, and in Essex, where William attended school and lived with his mother, the boy came strongly under the influence of Puritan modes of thought. In 1660, the year that witnessed the restoration of the Stuarts, Admiral Penn sent his son to the aristocratic Christ Church, Oxford, but the youth so disliked the ritualistic worship demanded of students there that he refused to attend chapel or church, and was fined in consequence. An English Quaker, Thomas Loe, completely converted him to the Quaker beliefs, and the boy either left college in disgust, or was banished because of his outspoken protests against what he denounced as "popery." He announced to his father that he was a Quaker, and was "whipped and beaten" and promptly driven from the house. His mother interceded for him, however, and his father sent him to France and Italy, in the hope that fashionable life abroad might cure him of his religious zeal. Penn returned with every sign of Quakerism gone, and his happy father gave him the responsible position of manager of several large Irish estates. Again, however, he met Loe, and became once more a Quaker,



Photo: Visual Education Service; from an old painting

PENN'S TREATY WITH THE INDIANS

this time never to backslide. Penn began to preach, refused to take off his hat to the king, and wrote such radical pamphlets denying orthodox views on the Trinity that he was imprisoned in the Tower of London for eight months. There he wrote *No Cross, No Crown*, one of the noblest English books on Christianity.

The death of his father in 1670 made him a wealthy man, but he continued his daily preaching, and once more was confined in the Tower for addressing unlawful congregations. Release came soon, however, and he visited Germany, where he became acquainted with many citizens of liberal religious views. This accounts mainly for the great number of German settlers in Pennsylvania a few years later. In 1675 Penn bought from a Quaker a large part of Western New Jersey, and found members of the persecuted sect so eager to seek refuge there that he petitioned Charles II to repay in American land an old debt that had been due his father and which amounted, with interest, to about $80,000. The king granted him the territory now comprising Pennsylvania and part of Maryland, and gave him absolute power to rule it as he wished. He opened the land to colonists and they emigrated by thousands. *A Frame of Government*, written by Penn as a code of laws, is still regarded as one of the most liberal charters, or constitutions, ever issued. His treaties with the Delaware Indians were so fair and generous, and were so strictly kept, that for more than a century very few redmen would attack a Quaker. Prosperity resulted from every venture the colonists made, and their principal town, Philadelphia ("City of Brotherly Love"), grew with astonishing rapidity.

Penn was a great favorite with Charles II and James I, who admired his courage and smiled good-naturedly over his "thou" and "thee" style of talking; but when William and Mary came to the throne, Penn found himself

suspected of various plots against the government, chief among which was a charge of attempted bribery in connection with pardons. For three years he was in hiding in London, while dissension aroused by other religious sects than his own threatened to ruin the Pennsylvania colony. In 1693, however, he was declared innocent of conspiracy, and in 1699 he again visited Pennsylvania. He soon adjusted all troubles and wrote a constitution which was so wise and liberal that the people used it until the colony became a state of the American Union.

In 1701 the plan of King William to declare Pennsylvania a royal province caused Penn to return quickly to London. There false claims for debts were pressed against him so harshly that he allowed himself to be thrown into Fleet Prison rather than pay them. This confinement shattered his health, and when, in 1709, he was released through the aid of friends who made a compromise settlement, he no longer possessed the spirit of former days. In 1710 he suffered a stroke of paralysis, but lived until July 30, 1718. These last years were brightened somewhat by the colonists' belated appreciation of his work for them, and by the extraordinary growth and prosperity of Pennsylvania. Statues to his memory stand in Philadelphia and New York B.M.W.



Photo: Brown Bros.

WILLIAM PENN

Related Subjects. The reader is referred in these volumes to the following articles

Debt (Imprisonment for) Pennsylvania Quakers



Photo Keystone

THE WILLIAM PENN HOUSE
Now in Fairmount Park, Philadelphia.

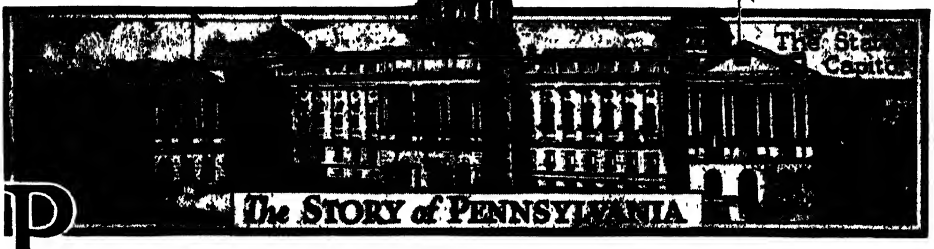
PENNAMITE-YANKEE WARS. See PENNSYLVANIA (Government and History: Creation of Pennsylvania).

PENNANT, a narrow streamer or flag displayed on vessels in addition to the flag of the nation, and carrying a special significance. A pennant decreases in width from the hoist to the tip. Pennants on ships of a navy provide information not only as to the national character of a ship, but are used in great variety for signaling.

PENNELL, *pen' el,* JOSEPH (1860-1926), an American etcher, illustrator, and author, of Quaker parentage. He received his early training at the Pennsylvania Academy of Fine Arts in Philadelphia, where he was born. In 1884, after an extended tour of Europe, he and his talented wife, Elizabeth Robins Pennell, settled in London, where they began their literary and artistic work. Pennell made known the picturesque qualities of old Philadelphia in a series of etchings, and he executed many notable Italian and English scenes, foremost among the latter being the *Thames Embankment* and the *Nelson Monument.* The text for several of his series was written by his wife, and *The Authorized Life of J. McN. Whistler* was their joint work. Pennell furnished illustrations for William Dean Howells' *Tuscan Cities,* an edition of Irving's *Alhambra,* Henry James's *Italian Hours,* and other notable books. In a series of etchings entitled *Pictures of the Panama Canal,* he pictured with wonderful fidelity that great waterway. His work, revealing a trained eye and strong intellect, shows sharp contrasts of light and shade and a fine grasp of composition.

Writings. Pennell's reputation as an author compares favorably with his fame as an artist His books include *A Canterbury Pilgrimage, An Italian Pilgrimage, Pen Drawings and Pen Draughtsmen, Modern Illustration, Lithography and Lithographers, Etchers and Etching,* and *Adventures of An Illustrator.*

PENNINE, *pen' ine,* **CHAIN.** See ENGLAND (Highlands and Lowlands).



PENNSYLVANIA, one of the thirteen original states of the American Union, is the southernmost and second largest state of the North Atlantic group and the leading mineral state.

Look past the smoke that to-day rises from Pennsylvania's great factories and steel mills to the scenes in the state's early history. In England, at the court of Charles II, waited a young man clad in sober Quaker gray; he was William Penn. To the gay and improvident Charles, the grant of 45,000 square miles of farming wilderness seemed an easier payment than £16,000 in good English gold. Also, it was an easy way to rid himself of Penn and a group of people with whom the Cavaliers had no sympathy. And so Pennsylvania came into existence.

A second picture appears. Two years later, Penn set sail from England and finally approached his new domain. Where now is the smoke of many factories, he beheld the blue haze of autumn on the wooded shores of the Delaware; where now is heard the noise of riveting in the shipyards, Penn heard the startled whir of wings, as hundreds of waterfowl and wild pigeons took flight before the sails of the *Welcome.*

Years pass, and again the scene is changed. Set in green fields, the substantial homes, churches, and taverns of Philadelphia appeared; ships, bound for England or the West Indies, passed down the Delaware; Quakers, Welsh, Dutch met in friendly toleration, finding, in "Penn's Woods," sanctuary from the persecution of Europe.

Many more years passed, and Penn's feudal colony became the great commonwealth of Pennsylvania, keystone of a mighty nation's industrial life.

Size and Location. Having a rectangular area of 45,126 square miles, of which 294 square miles are water surface, Pennsylvania ranks thirty-second in size among the states.

On the north it is bounded by a corner of Lake Erie, and by Pennsylvania's sister state, New York. Ohio lies on the west, and West Virginia forms part of both the western and southern lines. Maryland and Delaware on the south and New Jersey on the east complete Pennsylvania's neighbors.

The northern boundary of Pennsylvania once ran straight west, leaving the state without a port on Lake Erie. The early settlers realized the importance of such an outlet, and purchased from the United States government, for about $150,000, the triangle of land in the northwest corner of the state, on which has grown up the thriving industrial city of Erie. Pennsylvania is the only state which has commercial outlets to the Great Lakes, to the Gulf of Mexico, and to the Atlantic Ocean.

People. According to the census of 1920, Pennsylvania's population, numbering 8,720,017, was greater than that of any other state in the Union except New York; the 1928 estimate showed an increase to about 9,854,000. The average density of the population in 1920 was 194 5 persons to the square mile, which is over five times the average for the United States, and exceeded in only five states in the Union. The negro population, numbering 319,700 in 1923, is larger than that in any of the other Northern states.

Owing to its central location, liberal government, and religious toleration, the colony of Pennsylvania became a haven for Europeans, principally religious refugees from England, Ireland, Sweden, and especially Germany; the early population probably showed a greater mixture of nationalities than did that of any of the other original states. Many of the sects, such as the Quakers, Mennonites, Moravians, and Dunkers, have preserved their quaint customs, and are still found in many communities. The peculiar dialect of the "Pennsylvania Dutch," those industrious German farmers who were among the early settlers, is still heard in rural districts and in some of the towns. Probably of equal importance among the early settlers were the so-called Scotch-

Irish, who made their influence felt in Pennsylvania during the Revolution.

The state has a large foreign population to-day, owing to the great mines and factories which employ a large percentage of immigrants. Welsh, Italians, Poles, Russians, Austrians, Slovaks, Irish, and Germans are most numerous; the inhabitants of foreign birth and foreign parentage exceed 3,000,000.

Over sixty-four per cent of the population is urban, and two of the first ten cities in the United States are in Pennsylvania—Philadelphia and Pittsburgh. Other cities with over 50,000 inhabitants are Scranton, Reading, Erie, Harrisburg, Wilkes-Barre, Allentown, Johnstown, Altoona, Chester, Lancaster, Bethlehem, McKeesport, and York.

Over one-third of the inhabitants are adherents of the Roman Catholic Church. The Quakers and some of the German sects still exist, and the largest of the Protestant denominations are the Methodist, Lutheran, Presbyterian, Reformed Church, Baptist, Episcopal, and United Brethren, in the order named.

Education. From its earliest period, Pennsylvania made wise provision for public education, for in his "Frame of Government," William Penn provided that children under twelve years of age should be taught a trade. The famous Friends' public school, founded in Philadelphia in 1689 and chartered in 1697, still exists as the William Penn Charter School. The first free schools were opened in 1767, but public schools were unpopular because only those pupils whose parents confessed extreme poverty could be educated without payment of tuition fees. It was only after a bitter struggle in the state senate that the present system of public schools was adopted in 1834.

The school system is administered by the state superintendent of public instruction, who is appointed by the governor, and by a state council of education.

School attendance is compulsory, and illiteracy, averaging 4.6 per cent, is greatest among the foreign-born. A very great percentage of the children are of foreign parentage. The child-labor law transferred thousands from mines and mills into the schools, and the problem of teaching these children the language and ideals of America is being adequately met. Consolidation of one-teacher schools is providing for the country child educational advantages equal to those of the city.

In 1913 vocational courses were established in certain schools; and in 1921 art, health, and music were added to the curriculum. Handicapped children in Pennsylvania are receiving the same attention as the normal child; and self-improvement opportunities for the adult are reflected in the enrollment of approximately 100,000 working boys and girls and adults in the evening schools.

The year 1927 marked the beginning of the rule that all new teachers entering public-school service must hold a standard certificate. In 1920 the state assumed control of privately owned normal schools at Bloomsburg, California, Clarion, East Stroudsburg, Edinboro, Indiana, Kutztown, Lock Haven, Mansfield, Millersville, Shippensburg, Slippery Rock, and West Chester. These have now become teachers' colleges. The Cheyney Training School for Teachers was purchased at the same time, and now offers two years' and three years' curricula.

Among the many institutions of higher learning authorized to grant degrees are the following accredited colleges and universities:

INSTITUTION	CHARACTER	POSTOFFICE
Albright College	Coed	Myerstown
Allegheny College	Coed	Meadville
Beaver College for Women	Women	Jenkintown
Bryn Mawr College	Women	Bryn Mawr
Bucknell University	Coed	Lewisburg
Carnegie Institute of Technology	Coed	Pittsburgh
Cedar Crest College	Women	Allentown
College Misericordia	Women	Dallas
Dickinson College	Coed	Carlisle
Drexel Institute	Coed	Philadelphia
Dropsie College	Coed	Philadelphia
Duquesne University	Coed	Pittsburgh
Elizabethtown College	Coed	Elizabethtown
Franklin and Marshall College	Men	Lancaster
Geneva College	Coed	Beaver Falls
Gettysburg College	Coed	Gettysburg
Grove City College	Coed	Grove City
Haverford College	Men	Haverford
Irving College	Women	Mechanicsburg
Juniata College	Coed	Huntingdon
Lafayette College	Men	Easton
La Salle College	Men	Philadelphia
Lebanon Valley College	Coed	Annville
Lehigh University	Men	Bethlehem
Lincoln University	Men	Lincoln University
Marywood College	Women	Scranton
Moravian College and Theological Seminary	Men	Bethlehem
Moravian College for Women	Women	Bethlehem
Mount Saint Joseph	Women	Philadelphia
Muhlenberg College	Coed	Allentown
Pennsylvania College for Women	Women	Pittsburgh
Pennsylvania Military College	Men	Chester
Pennsylvania State College	Coed	State College
Pennsylvania State Forest School	Men	Mont Alto
Rosemont College	Women	Rosemont
Saint Francis College	Men	Loretta
Saint Joseph College	Men	Philadelphia
Saint Thomas College	Women	Scranton

INSTITUTION	CHARACTER	POSTOFFICE
Saint Vincent College	Men	Beatty
Susquehanna University	Coed	Selinsgrove
Swarthmore College	Coed	Swarthmore
Temple University	Coed	Philadelphia
Thiel College	Coed	Greenville
University of Pennsylvania	Coed	Philadelphia
University of Pittsburgh	Coed	Pittsburgh
Ursinus College . .	Coed	Collegeville
Villa Maria College .	Women	Immaculata
Villanova College	Men	Villanova
Washington and Jefferson College	Men	Washington
Waynesburg College .	Coed	Waynesburg
Westminster College .	Coed	New Wilmington
Wilson College	Women	Chambersburg

University of Pennsylvania. This institution is the outgrowth of a charitable school founded in 1740 in Philadelphia. Through the activity of Benjamin Franklin and the efforts of a group of other public-spirited citizens, the school was made an academy in 1751. Two years later it received a



THE UNIVERSITY IN 1765

charter from the son and the grandson of William Penn, and in 1755 was rechartered as the College and Academy of Philadelphia. In 1791 the present institution, which represents a merger of the old college and a university provided by act of legislature in 1779, was incorporated under the title University of Pennsylvania. The campus, since 1872, has been on a site near the west bank of the Schuylkill. The student enrollment is now about 17,000.

Institutions of Charity and Correction. Pennsylvania is among the most progressive states in the study of the welfare of the dependent classes. A welfare department was created by the legislature in 1921, which assumed the duties of the former board of public charities, the lunacy committee, and the prison-labor board. In 1925 a council for the blind was added to this department, of which the state superintendent of public instruction is a member. The department is directed by the secretary of welfare and a board of commissioners, and consists of four bureaus: mental health, assistance, children, and restoration. Industrial work in the penitentiaries and reformatories is an important activity of the bureau of restoration. There are state hospitals for the insane at Allentown, Danville, Fairview, Harrisburg, Norristown, Torrence, Warren, and Wernersville, and state-owned medical and surgical hospitals at Ashland, Blossburg, Coaldale, Connellsville, Hazelton, Shenandoah, Nanticoke, Philipsburg, Scranton, and Shamokin; institutions for the feebleminded are the Pennhurst, Polk, and Laurelton state schools; there is an industrial reformatory at Huntingdon, and state correctional institutions are maintained at Morganza and Muncy. Penitentiaries are located at Philadelphia, Pittsburgh, and Rockview; a new eastern penitentiary is being developed at Graterford; there is a soldiers' and sailors' home at Erie. Institutions for the deaf and blind are at Philadelphia, Pittsburgh, and Scranton.

Physical Features

Surface. Pennsylvania may be divided into four provinces—the Allegheny plateaus at the west and north, the Valleymont region crossing the center and bending eastward, the Kittatinny trench crossing northeast and southwest in the southeastern quarter of the state, and the Piedmont upland covering the southeast corner. The Allegheny plateaus consist in the main of broad-topped divides, often plateau-like, and intersected by deep, narrow, steep-sided valleys. At the north-central part of the state, these plateaus reach 2,000 feet and more, declining in elevation toward the east, west, and southwest to about 1,200 feet in the Pittsburgh region. In the southwest corner, the plateau character is less pronounced, the valleys more open, and the divides narrower. The plateau region ends at the east in Allegheny Mountain, a ridge steep-sided on the east, with an elevation of 2,000 to 2,900 feet. West of that, Chestnut Ridge and Laurel Hill project northeastward from the south boundary of the state, and between Chestnut Ridge and Allegheny Mountain, most of the land is high; much of it is above 2,500 feet, reaching in Negro Mountain an altitude of 3,220 feet, the highest point in the state.

The Valleymont region is a belt from forty to sixty miles wide, consisting of very narrow, even-crested ridges separated by broad, usually fertile valleys. The mountains rise to elevations of from 1,300 to 2,900 feet, and are usually a thousand feet or more above the adjoining valleys.

South and east of the Valleymont region lies the broad fertile area which comprises the Lehigh, the Lebanon, and the Cumberland valleys. This section corresponds to the Shenandoah Valley of Virginia and the Kittatinny



Photo Gable Co

HORSESHOE CURVE, ON THE PENNSYLVANIA RAILROAD

Valley of New Jersey. South of it lies a narrow mountainous belt, the South Mountains and the Reading Hills. Much of the Piedmont upland is fertile valley land underlain by limestone; there is also a large amount of rough upland in that section. The northwestern corner of the state slopes to a narrow belt of rich flat lands along Lake Erie.

Rivers and Lakes. Pennsylvania is drained by three great rivers: the Delaware drains the eastern edge of the state; the Susquehanna drains all of the central and much of the northern part; the Ohio, formed by the Allegheny and Monongahela, provides drainage in the west. Minor areas are drained by the Genesee to Lake Ontario, directly into Lake Erie, and into the Potomac River. As these rivers became established before the land assumed its present surface features, the streams have been little affected by the present position of the valleys and ridges, and run transverse to them, cutting gaps that both add to the scenery and facilitate communication. The chief branches of the Delaware are the Lackawaxen, Lehigh, and Schuylkill rivers.

The many beautiful waterfalls descending over rocky ledges and boulders in the glaciated region add to the state's grandeur and are a source of water power.

Climate. In the southeastern section, which is protected by the mountain ridges and swept by ocean winds, the climate is mild and equable In the interior valleys, the winters are cold and the summers are intensely hot. The mountains, however, are delightfully cool in the summer, and in them are many summer homes and hotels. The annual temperature decreases toward the northwest, but in the Erie plain, the moderating influence of the lakes is felt. At Philadelphia the winter temperature averages 34°, and the mean summer temperature is 74°.

The annual rainfall averages about forty inches. Rains are plentiful in all parts of the state, ranging from fifty inches in the southeast to thirty-one inches in the northwest and southeast sections. Northwest of the Blue Mountains there are heavy snows, which sometimes cover the ground the entire winter and flood the streams in spring.

Sources of Pennsylvania's Wealth

Agriculture. Pennsylvania is generally more fertile than the other North Atlantic states, and in its rich valleys are some of the most prosperous farms in the East. Over fifty-six per cent of the area of the state is in farms, and about two-thirds of the farmlands are improved. Cereals and hay are about the most valuable crops. Of these, corn is the most important. Wheat, oats, and rye are also harvested in large quantities, and in the raising of buckwheat, Pennsylvania leads all of the states except, in some years, New York. Hay and cereals are grown in almost every farming district of the state.

Although more potatoes are raised than in any of the other Eastern states except Maine and New York, yet the state does not raise enough to equal its own consumption. In the growing of vegetables for the market, which is especially important near Philadelphia and Pittsburgh, the state is outranked only by New York and Ohio. The great mining and manufacturing centers furnish a steady and profitable market for the truck and dairy farmers. Small fruits are also extensively cultivated near the large cities. The largest orchards are in the mild southeastern section; apples, peaches, and pears are the principal



Photo: Brown Bros.

IN THE OIL FIELDS, AT OIL CITY

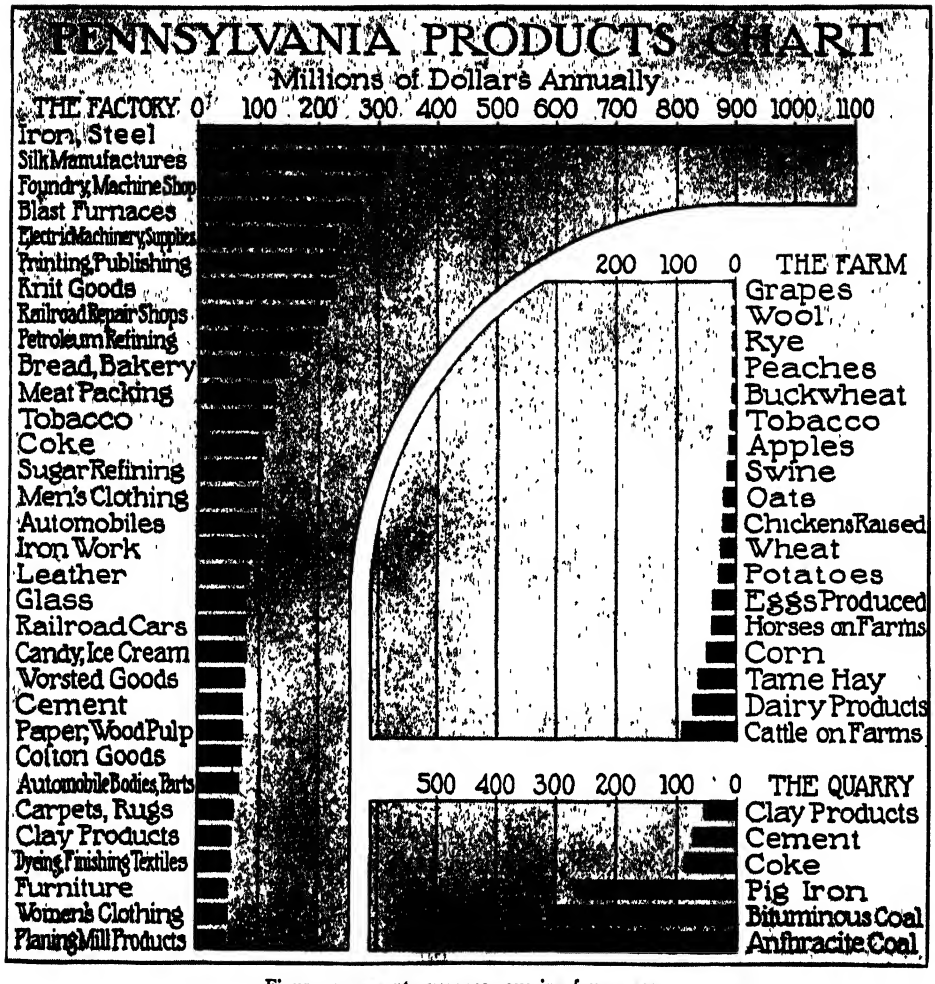
fruits, though cherries, plums, prunes, and apricots are also grown. Most of the grapes are cultivated in the Lake Erie region. This region is excellent for apples and peaches, as the cool lake winds retard blossoming until danger from frost is over. The mountain sections are being developed as fruit orchards, since slopes too steep for grain may be used for fruit and nut trees. A state commission of agriculture was created in 1915; experiment stations had previously been established.

Pennsylvania leads all of the Eastern states in the value of poultry, and in the income from dairy products, the Keystone State ranks among the first five states in the Union. General farming and raising of livestock predominate throughout the state, save in the northern counties, where dairying is of prime importance, and in the coastal sections, where fruit-growing is favored.

Forests. When first settled, Pennsylvania was covered with primeval forests of white pine, hemlock, and other timber, but the ax of the lumberman has sadly changed the great timberlands of "Penn's Woods." The state is, however, doing much toward the restoration and protection of timberlands; there are several state nurseries and over 1,000,000 acres in forest reserves. A state commissioner and a department of forestry have been provided, and Pennsylvania has the only state forest academy in the country. Seedlings are distributed at cost for the growing of private woodlands, and municipal forests may be established with the consent of the commissioner in any city, borough, or town of the first class. About one-half of the area of the state is still forested land, but the virgin growth and the greater part of the merchantable timber have been cut. Many of the mountain slopes are covered with white and yellow pines and hemlocks, and in the valleys are forests of hickory, elm, maple, beech, walnut, and chestnut, and groves of cedar, holly, tulip, and magnolia trees.

Minerals. Pennsylvania exceeds all the rest of the states in the value of its mineral products. The output of its mines, excluding the derived products, is nearly one-fourth of the entire output for the United States. This position is due principally to the state's leadership in the production of coal. Practically all the anthracite coal fields in the United States are in Pennsylvania.

Anthracite coal was discovered in 1768 in the Wyoming Valley in Pennsylvania. It was at first considered too hard to burn and therefore worthless, and not until the early part of the next century were its use and value learned. The mining of anthracite increased from one ton a day in 1820 to about 140,000 tons a day in 1900, and the present output ranges from 60,000,000 to 90,000,000 short tons per year. The workable anthracite fields cover about 480 square miles; the estimated available supply exceeds 16,150,000,000 short tons, and there are 14,200 square miles of bituminous coal in which the supply still available is probably over 108,400,000,000 short tons.



Figures represent averages covering four years.

Pennsylvania's output of beehive coke is more than five times as great as the combined production of all other states in the Union; while the output of by-product coke is about one-fourth of the nation's total, and greater than that of any other one state.

Two other great sources of fuel are petroleum and natural gas. The first oil well in the United States was in Pennsylvania, and long ago the Indians had discovered the value of petroleum as an internal and external medicament. Although the state once ranked first in the value of petroleum, the present output is small as compared with that of the new Western fields.

Iron ore, slate, clay, limestone, lime, glass, sand, and gravel are among the other minerals and products of commercial importance.

Manufacture. The abundance of fuel and raw materials, excellent means of transportation, availability of cheap labor, and the proximity of markets such as New York, Philadelphia, and Pittsburgh, have all combined to develop the stupendous manufacturing industries of Pennsylvania, which surpass those of any other state except New York.

The early days of Penn's colony saw rude forges set up for the manufacture of necessary articles made from iron ore. Ore was plentiful and easy to mine, and as early as 1719, iron was being shipped to England, to the distaste of the English ironmakers. In 1756 Pennsylvania was said to be the "most advanced of the American colonies in regard to its ironworks," and it has continued to be the country's greatest producer of iron and steel products, this state producing nearly half the steel of the United States. The annual output of pig iron far surpasses that of any other state of the American Union.

PENNSYLVANIA

Albion, (A2)..... 1,549
Alburtis, (F3)..... 795
Aliquippa, (A3) . 2,931
Allentown, (F3). .73,502
Altoona, (C3) . .60,331
Ambridge, (A3) . .12,730
Antrim, (D2) . . . 1,500
Archbald, (F2) . 8,603
Ardmore, (F3) . 3,700
Arnold, (B3). . 6,120
Arnot, (D2) . . 2,750
Ashland, (E3) . 6,666
Ashley, (F2) . . 6,520
Athens, (E2) .. 4,384
Auburn, (E3) .. 977
Austin, (C2).. . 1,556
Avalon, (A3) . .. 5,277
Avis, (D2) 1,092
Avoca, (F2). .. 4,950
Avondale, (F4). .. 527
Avonmore, (B3) .. 1,242
Bangor, (F3) . . 5,402
Bath, (F3) . . . 1,401
Beaver, (A3). . . 4,135
Beaver Falls, (A3) 12,802
Beavertown, (D3) 525
Bechtelsville, (F3) 502
Bedford, (C3) . 2,330
Beech Creek, (D2) 573
Bellefonte, (D3) . 3,996
Belleville, (D3) .. 400
Bellevue, (A3) 8,198
Bellwood, (C3). 2,629
Benton, (E2) 696
Berlin, (C4) . . 1,563
Berwick, (E2) .. 12,181
Bessemer, (A3) . 1,417
Bethlehem, (F3) 50,358
Biglerville, (D4) 539
Big Run, (C3) . 1,023
Birdsboro, (F3) 3,299
Bitumen, (D2) . 700
Black Lick, (B3) 1,500
Blairsville, (B3) 4,391
Blakely, (F2) 6,564
Blandburg, (C3) 1,000
Bloomsburg, (E2) 7,819
Blossburg, (D2) 2,033
Bolivar, (B3) 766
Boswell, (B3) . 2,168
Boyertown, (F3) 3,189
Braddock, (B3) 20,879
Bradford, (C2) 15,525
Bradys Bend, (B2) 500
Bridgeport, (F3) 4,680
Bridgeville, (A3) 3,092
Brisbin, (C3) . . 570
Bristol, (G3) 10,273
Broad Ford, (B3) . 500
Broad Top, (C3) 519
Brockwayville, (C2) 2,369
Brookville, (B2) 3,272
Brownfield, (B4) 1,500
Brun, (B2) 720
Burgettstown, (A3) 1,990
Butler, (B3) 23,778
California, (B3) 2,480
Cambridge Springs, (B2) 1,663
Canonsburg, (A3) 10,612
Canton, (E2) 2,154
Carbondale, (F2). 18,640
Carlisle, (D3) 10,916
Carnegie, (A3) 11,516
Carrick, (A3) 10,504
Cartwright, (C2) 1,000
Catasauqua, (F3) 4,714
Catawissa, (E3). 2,025
Cecil, (A3).... 1,500
Central City, (C3). 1,051
Centre Hall, (D3). 525
Chambersburg, (D4). 13,171
Charleroi, (A3) . 11,516
Cherrytree, (C3) 555
Chester, (F4) . 58,030
Christiana, (E4).. 985
Clairton, (B3) . . . 6,264
Clarendon, (B2). . 928
Claridge, (B3).... 1,800
Clarion, (B2) . . . 2,793
Claysville, (A3)... 1,009
Clearfield, (C2)... 8,529
Coaldale, (F3).... 6,336
Coalport, (C3).... 1,079
Coatesville, (F3). .14,515
Cochranton, (A2). 647
Columbia, (E3) . .10,836
Conemaugh, (C3). 2,632
Confluence, (B4).. 1,031
Conneautville, (A2) 969
Connellsville, (B3) 13,804
Conoquenessing, (A3) 430
Conshohocken, (F3) 8,481
Coopersburg, (F3) 870
Corapolis, (A3) 6,162
Cornwall, (E3) 800
Corry, (B2).... 7,228
Costello, (C2) . 1,100
Coudersport, (D2) 2,836
Crabtree, (B3) ... 800
Crafton, (A3) . .. 5,954
Cranesville, (A2) 548
Creekside, (B3) . 663
Cresson, (C3) . . 2,170
Curwensville, (C3) 2,973
Dallastown, (E4).. 2,124
Danville, (E2) . 6,952
Darby, (F4) 7,922
Dauphin, (E3) 598
Dayton, (B3) 1,049
Delaware Water Gap, (F3) 373
Delta, (E4) ... 858
Denver, (E3) 1,125
Derry, (B3) 2,889
Dickson, (F2) 11,049
Dillsburg, (E3) 924
Dixonville, (B3) 800
Donora, (B3) 14,131
Dormont, (A3) 6,455
Downingtown, (F3) 4,024
Doylestown, (F3) 3,837
Driftwood, (C2) . 478
Du Bois, (C2) 13,681
Dunbar, (B4) 1,607
Duncannon, (D3) 1,679
Dunlo, (C3) 1,800
Dunmore, (F2) 20,250
Duquesne, (B3) 19,011
Duryea, (F2) . 7,776
Dushore, (E2) 776
East Berlin, (D4) . 610
East Brady, (B3) 1,531
East Conemaugh, (C3) . 5,256
East Greenville, (F3) . . 1,620
Easton, (F3) 33,813
East Pittsburgh, (B3) . 6,527
East Stroudsburg, (F2) 4,855
East Waynesburg, (A4). 886
Ebensburg, (C3) 2,179
Eddystone, (F4) 2,670
Edinboro, (A2) 835
Edwardsville, (F2) 9,027
Eldred, (C2) 1,037
Elizabethtown, (E3) 3,319
Elizabethville, (E3) 1,236
Elkland, (D2) 1,703
Ellwood City, (A3) 8,958
Emaus, (F3) 4,370
Emeigh, (C3) 400
Emlenton, (B2) 1,025
Emporium, (C2) 3,036
Ephrata, (E3) 3,735
Erie, (A1) 93,372
Etna, (B3) 6,341
Evans City, (A3) 1,548
Everett, (C3) 1,687
Everson, (B3) 1,988
Factoryville, (F2) 628
Fairchance (B4) 2,124
Fairfield, (D4) 401
Falls Creek, (C2) 1,364
Farrell (A2). . 15,586
Ferndale, (B3) 1,450
Fleetwood, (F3) . 1,652
Ford City, (B3) . 5,605
Forest City, (F2) 6,004
Foxburg, (B2) 600
Frackville, (E3). 5,590
Franklin, (B2) .. 9,970
Fredonia, (A2).... 422
Freedom, (A3).... 3,452
Freeland, (F2)..... 6,666
Freeport, (B3)..... 2,696
Gaines, (D2)..... 1,000
Galeton, (D2). .. 2,969
Gallitzin, (C3) .. 3,580
Garrett, (B4) .. 859
Genesee, (D2) .. 500
Gettysburg, (D4).. 4,439
Girard, (A1) . .. 1,242
Glassport, (B3) .. 6,959
Glen Campbell, (C3) . . . 1,059
Glenlyon, (E2) 2,400
Glen Rock, (E4) . 1,232
Grampian, (C3) . 677
Greencastle, (D4) 2,271
Greensboro, (A4) 516
Greensburg, (B3) 15,033
Greenville, (A2) .. 8,101
Grove City, (A2). 4,944
Hallstead, (F2) 1,261
Hallton, (C2) 500
Hamburg, (F3) 2,764
Hanover, (E4) 8,664
HARRISBURG, (E3) 75,917
Hastings, (C3) . 2,292
Hawley, (F2) 1,939
Hawthorn, (B2) . 665
Hazleton, (F3) .32,277
Heilwood, (C3) 1,000
Herndon, (E3) 650
Hollidaysburg, (C3) 4,071
Homer City, (B3) 1,802
Homestead, (A3) 20,452
Honesdale, (F2) 2,756
Hopewell, (C3) 516
Houston, (A3) 1,398
Houtzdale, (C3) . 1,504
Howard, (D2) . 621
Hoytville, (D2) . 700
Hughesville, (E2). 1,577
Hummelstown, (E3) 2,654
Huntingdon, (D3) 7,051
Hyndman, (C4) 1,179
Idamar, (B3) . 800
Indiana, (B3) 7,043
Irvona, (C3) . . 1,157
Irwin, (B3) . . 3,235
Jamestown, (A2) 818
Jeannette, (B3) 10,627
Jerome, (B3) 1,000
Jersey Shore, (D2) 6,103
Johnsonburg, (C2) 5,400
Johnstown, (C3) 67,324
Josephine, (B3) .. 2,000
Juniata, (C3) . 7,660
Kane, (C2) 7,283
Kennett Square, (F4) 2,398
Kingston, (E2) 8,952
Kinzua, (C2) 900
Kittanning, (B3) 7,153
Knoxville, (B3) 7,201
Knoxville, (D2) . 696
Kutztown, (F3) 2,684
Laceyville, (E2) 466
Lackawaxen, (F2) 500
Lancaster, (E3) 53,150
Landenberg, (F4). 700
Lanesboro, (F2).. 803
Lansdale, (F3) 4,728
Lansford, (F3) . 9,625
Larksville, (F2) 9,438
Latrobe, (B3) . 9,484
Lawrenceville, (D2) 508
Lebanon, (E3) 24,643
Leechburg, (B3) .. 3,991
Lehighton, (F3). . 6,102
Lemoyne, (E3) . 1,939
Lewisburg, (E3) .. 3,204
Lewis Run, (C2).. 665
Lewistown, (D3). 9,849
Liberty, (B3) .. 601
Ligonier, (B3) . 1,807
Linesville, (A2) 1,015
Littlestown, (D4) 1,552
Lloydell, (C3) .. 800
Lock Haven, (D2). 8,557
Loganton, (D2)... 254
Loyalsock, (E2)... 850
Luzerne, (F2)..... 5,998
Lykens, (E3)..... 2,880
McAdoo, (E3).... 4,674
McConnellsburg, (C4)..... 689
McKeesport, (B3). 46,781
McKees Rocks, (A3)... 16,713
McVeytown, (D3) 480
Mahaffey, (C3)... 801
Mahoney City, (E3) 15,599
Mainville, (E3) .. 625
Mammoth, (B3) . 1,000
Manheim, (E3)... 2,712
Manor, (B3) 1,077
Mansfield, (D2) . 1,609
Marcus Hook, (F4) 5,324
Marianna, (A3) . 1,124
Marienville, (B2) . 2,000
Mars, (A3) 1,226
Martinsburg, (C3) 955
Marysville, (D3) . 1,877
Matamoras, (G2) 1,535
Mauch Chunk, (F3) 3,666
Meadville, (A2) .14,568
Mechanicsburg, (D3) 4,688
Media, (F4)..... 4,109
Mercer, (A2) .. . 1,932
Mercersburg, (D4) 1,663
Meshoppen, (E2) . 608
Meyersdale, (B4) . 3,716
Middleburg, (D3) 984
Middletown, (E3) 5,920
Midland, (A3) . . 5,452
Mifflin, (D3).... 965
Mifflinburg, (D3) 1,744
Mifflintown, (D3) 1,083
Milesburg, (D3) . 545
Milford, (G2) . . 768
Millersburg, (E3) 2,936
Millerstown, (B3) 802
Millerstown, (D3) 616
Millersville, (E4) 1,350
Mill Hall, (D2) . 1,238
Millheim, (D3).. . 515
Millvale, (B3).... 8,031
Millville, (E2) . . 658
Milroy, (D3)..... 1,500
Milton, (E2) . . . 8,638
Minersville, (E3) 7,845
Monessen, (B3) 18,179
Monongahela, (A3) 8,688
Monroeton, (E2) 500
Montgomery, (E2) 1,798
Montrose, (F2) . 1,661
Morris, (G3) . . . 700
Morrisdale, (C3) 670
Morris Run, (E2) 1,600
Morrisville, (G3) 3,639
Moscow, (F2) . 702
Mount Carmel, (E3) 17,469
Mount Holly Springs, (D3) 1,109
Mount Jewett, (C2) 1,494
Mount Oliver, (A3) 5,575
Mount Pleasant, (B3) 5,862
Mount Pocono, (F2) 500
Mount Union, (D3) 4,744
Mount Wolf, (E3) 688
Muncy, (E2) . . . 2,054
Munhall, (B3) .. 6,418
Nanticoke, (E2) ..22,614
Nanty Glo (C3). 5 028
Narberth, (F3).... 3,704
Nazareth, (F3) .. 4,288
Nescopeck, (E2) . 1,638
New Albany, (E2). 315
New Bethlehem, (B3) 1,662
New Bloomfield, (D3) 778
New Brighton, (A3) 9,361
New Castle, (A2) 44,938
New Freedom, (E4) 906
New Galilee, (A3) 475
New Holland, (E3) 1,453
New Hope, (F3)... 1,093
New Kensington, (B3)..... .11,987
New Milford, (F2) 644
Newport, (D3)... 1,972
Newtown, (G3)... 1,703
Newville, (D3).... 1,482
New Wilmington, (A2). 886
Nicholson, (F2)... 842
Norristown, (F3) .32,319
Northampton, (F3) 9,349
North Braddock, (B3)..... .14,928
North East, (B1).. 3,481
Northumberland, (E3) 4,061
North Wales, (F3) 2,041
Noxen, (E2) 800
Oakland, (F2).... 1,120
Oakmont, (B3).... 4,512
Oil City, (B2) . . 21,274
Old Forge, (F2)...12,237
Olyphant, (F2) ...10,236
Orbisonia, (D3) . 682
Orson, (F2) 530
Osceola, (D2)..... 568
Osceola Mills, (C3) 2,512
Oxford, (E4) . . 2,093
Palmerton, (F3) . 7,168
Parkers Landing, (B2) 1,188
Parsons, (F2) 5,628
Patton, (C3)..... 3,628
Perkasie, (F3) . . 3,150
Petersburg, (C3) . 691
Philadelphia, (F4) . . .1,823,779
Philipsburg, (F3) . 3,900
Phoenixville, (F3) 10,484
Pine Grove, (E3) . 1,778
Pitcairn, (B3) . . . 5,738
Pittsburgh, (B3) 588,343
Pittston, (F2) . .18,497
Pleasantville, (B2) 652
Plumville, (B3)... 538
Plymouth, (E2) 16,500
Point Marion, (B4) 1,607
Polk, (B2) 2,662
Portage, (C3) . . 4,804
Port Allegany, (C2) 2,356
Port Clinton, (E3). 474
Portland, (F3).... 545
Port Royal, (D3).. 558
Pottstown, (F3) 17,431
Pottsville, (E3) 21,876
Prospect, (A3) .. 395
Prospect Park, (F4) 2,536
Punxsutawney, (B3) . . .10,311
Quakertown, (F3). 4,391
Quarryville, (E4).. 823
Ralston, (E2)..... 900
Ramey, (C3) . . . 1,093
Rankin, (B3) 7,301
Reading, (F3) ..107,784
Red Lion, (E4). .. 3,198
Reedsville, (D3)... 700
Renfrew, (B3)..... 500
Renovo, (D2)... . 5,877
Republic, (B4).. . 1,000
Reynoldsville, (C2) 4,116
Ridgway, (C2). . 6,037
Riegelsville, (F3) . 610
Rimersburg, (B2) 1,060
Roaring Spring (C3) 2,379
Rochester, (A3)... 6,957
Rockwood, (B4)... 1,362
Rossiter, (C3) . . 1,500
Rouseville, (B2) . 818
Royersford, (F3) . 3,278
Saegerstown, (A2). 659
Sagamore, (B3) .. 2,100
Saint Clair, (B3).. 6,585
Saint Clair, (E3) . 6,495
Saint Marys, (C2). 6,967
Saint Petersburg, (B2)... 454
Salisbury, (B4).... 951
Saltillo, (C3)..... 418
Saltsburg, (B3)..... 1,022
Sandy Lake, (A2). 645
Saxton, (C3)..... 1,165
Sayre, (E2)..... 8,078



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How to Read a Map. See page xvi, facing text page 1.

PENNSYLVANIA *Continued*

Schuylkill Haven, (E3) 5,437
Scottdale, (B3) 5,768
Scranton, (F2) 137,783
Selinsgrove, (E3) 1,937
Sellersville, (F3) 1,739
Seward, (B3) 657
Sewickley, (A3) 4,955
Shamokin, (E3) 21,204
Sharon, (A2) 21,747
Sharpsburg, (B3) 8,921
Sharpsville, (A2) 4,674
Sheffield, (B2) 1,525
Shenandoah, (E3) 24,726
Sheppton, (E3) 1,000
Shinglehouse, (C2) 1,169
Shippensburg, (D3) 4,372
Shippenville, (B2) 452
Sinking Spring, (E3) 1,270
Sinnamahoning, (C2) 700
Slatington, (F3) 4,014
Sligo, (B2) 801
Slippery Rock, (A2) 826
Smethport, (C2) 1,568
Snow Shoe, (C2) 650
Somerset, (B3) 3,121
Souderton, (F3) 3,125
South Brownsville, (B3) 4,675
South Fork, (C3) 4,239
South New Castle, (A3) 920
South Waverly, (E2) 1,251
South Williamsport, (E2) 4,341
Spartansburg, (B2) 450
Springboro, (A2) 542
Spring Grove, (E4) 1,115
Starrucca, (F2) 397
State College, (D3) 2,405
Steelton, (E3) 13,428
Stewartstown, (E4) 718
Stoneboro, (A2) 1,405
Strasburg, (E4) 853
Stroudsburg, (F3) 5,278
Summerville, (B2) 1,199
Summithill, (F3) 5,499
Sunbury, (E3) 15,721
Susquehanna, (F2) 3,764
Swarthmore, (F4) 2,350
Swissvale, (B3) 10,908
Swoyersville, (F2) 6,876
Sykesville, (C2) 2,507
Tamaqua, (E3) 12,363
Tarentum, (B3) 8,925
Taylor, (F2) 9,876
Temple, (F3) 400
Throop, (F2) 6,672
Tidioute, (B2) 1,063
Tioga, (D2) 368
Tionesta, (B2) 642
Titusville, (B2) 8,432
Tobyhanna, (F2) 600
Topton, (F3) 1,147
Towanda, (E2) 4,269
Tower City, (E3) 2,324
Tremont, (E3) 2,015
Trevorton, (E3) 1,400
Troy, (E2) 1,419
Tunkhannock, (F2) 1,736
Turtle Creek, (B3) 8,138
Tyler, (C2) 600
Tyrone, (C3) 9,084
Ulysses, (D2) 526
Union City, (B2) 3,850
Uniondale, (F2) 370
Uniontown, (B4) 15,692
Vandergrift, (B3) 9,531
Vintondale, (C3) 2,053
Wampum, (A3) 882
Warren, (B2) 14,272
Washington, (A3) 21,480
Waterford, (A2) 744
Watsontown, (E2) 2,153
Waverly, (E2) 515
Waymart, (F2) 507
Wayne, (F3) 3,000
Waynesboro, (D4) 9,720
Waynesburg, (A4) 3,332
Weatherly, (F3) 2,356
Wellsboro, (D2) 3,452
Wesleyville, (B1) 1,457
West Alexander, (A3) 416
West Chester, (F4) 11,717
Westfield, (D2) 1,303
West Grove, (F4) 1,152
West Hazleton, (F3) 5,854
West Kittanning, (B3) 861
West Middlesex, (A2) 1,349
West Pittsburg, (A3) 500
West Pittston, (F2) 6,96
Wheatland, (A2) 1,74
White Haven, (F2) 1,40
White Mills, (F2) 1,45
Wilkes-Barre, (F2) 73,83
Wilkinsburg, (B3) 24,40
Williamsburg, (C3) 1,87
Williamsport, (E2) 36,19
Williamstown, (E3) 2,87
Wilmerding, (B3) 6,441
Winburne, (C3) 1,250
Windber, (C3) 9,462
Wind Gap, (F3) 1,133
Winton, (F2) 7,583
Womelsdorf, (E3) 1,331
Woodland, (C2) 850
Woodlawn, (A3) 12,495
Wrightsville, (E3) 1,943
Wyalusing, (E2) 628
Wyomissing, (E3) 2,062
Yoe, (E4) 535
York, (E4) 47,512
Yorkhaven, (E3) 779
Youngsville, (B2) 1,611
Youngwood, (B3) 2,275
Zelienople, (A3) 1,870

The steel products of Pennsylvania and the skill of its engineers are famous in all parts of the world. The bridge over the Atbara River in the Sudan in Africa and the Hawkesbury River bridge in Australia are made of Pennsylvania steel. The Baldwin locomotives and the Westinghouse air brake are used by railroads in all parts of the world; in the construction of steel cars and locomotives, Pennsylvania is without a rival among the states. Another important branch of steel construction is the building of ships; the yards bordering the Delaware in the vicinity of Philadelphia and Chester are the largest in the world, with the exception of the Clyde yards in Scotland. Steel products of every kind, from huge construction machinery used in such undertakings as the Panama Canal, to the delicate instruments of science, are made in Pennsylvania's great mills and factories.

In value of product, the manufacture of silk ranks second to iron and steel in the list of Pennsylvania's industries. The making of textiles was one of the state's earliest industries; from Pennsylvania's woolen mills came the cloth for the uniforms of Washington's army. To-day, the extensive manufacture of worsted, cotton, woolen, and knit goods, together with that of silks, makes Pennsylvania a great textile state.

Preeminently a manufacturing state, the list of Pennsylvania's industries is a long one. Among the principal enterprises are the manufacture of foundry and machine-shop products and of electrical apparatus and supplies, car and locomotive construction, printing and publishing, the refining of petroleum and coke, leather and glass manufacture, the refining of sugar, the making of cement, and countless other industries, covering a large proportion of the articles used throughout the world.

Manufacturing was greatly benefited by the great Susquehanna hydroelectric power project, the first two units of which were opened March 1, 1928, at Conowingo, Md. When the whole project came into operation, it was second to Niagara Falls in power production. Philadelphia receives about 594,000 horse power from it, but Maryland, Delaware, and New Jersey also benefit (See MARYLAND).

Transportation. The story of transportation in Pennsylvania moves along with the story of the nation's growth. Once only the Indian canoe skimmed along the great rivers of the state. Then came the white men and their crude flatboats for the transportation of coal and ore, then the keel boats, and later, the steamboat, imperfect, slow, yet ever lessening the distance between the settled Eastern states and the Far West of the pioneers.

Through Pennsylvania, along the well-worn Indian trails, went the great westward stream of emigrants, first on foot or on horseback, and later in the famous Conestoga wagons, or "prairie schooners." Canals were built to connect turnpike and stream, but as the railroad developed, the canals were neglected.

In 1829, at Honesdale, Pa., the first locomotive in America was operated. This was the "Stourbridge Lion," built in England and brought over for use on the Delaware & Hudson's coal road. Now there are over 11,000 miles of railroad in the state, a mileage exceeded only in Texas and Illinois. The most important roads are the Pennsylvania; Reading System; Lehigh Valley; Baltimore & Ohio; New York Central; Erie; Buffalo, Rochester & Pittsburgh; Delaware, Lackawanna & Western; Delaware & Hudson; Central Railroad of New Jersey; Western Maryland; Buffalo & Susquehanna; and Bessemer & Lake Erie. Philadelphia and Pittsburgh are the chief railroad centers. Railroads are controlled by a public-utilities commission, created in 1913. There are over 4,500 miles of electric railway in the state. With its great railroad systems and navigable rivers, with its three great outlets, the Gulf of Mexico, the Great Lakes, and the Atlantic, Pennsylvania has unexcelled facilities for commerce.

Government and History

Government. The constitution of 1873, with a few amendments, is the present basic law of the state. Amendments may originate in either house of the legislature, and to become effective must be adopted by two successive assemblies and receive the affirmative vote of the people. In 1913 the department of labor and industry was created to enforce laws relating to health and safety. Workmen's compensation acts, old-age pensions, and advanced child-labor laws are in force. In 1923 a new administrative code was enacted, providing for the consolidation of the existing administrative agencies into twelve departments. Harrisburg has been the capital since 1812.

Legislative Department. The lawmaking body is the general assembly, consisting of a senate and a house of representatives. One senator is chosen from each of fifty senatorial districts, and one-half of the body is elected every two years. The representatives, 208 in number, are elected for terms of two years. The legislature meets on the first Tuesday in January, in the odd-numbered years. There is no prescribed limit to the length of sessions.

Executive Department. The power of administering the government is vested in a governor, lieutenant governor, auditor-general, state treasurer, and secretary of internal affairs, who are elected for a term of four years.

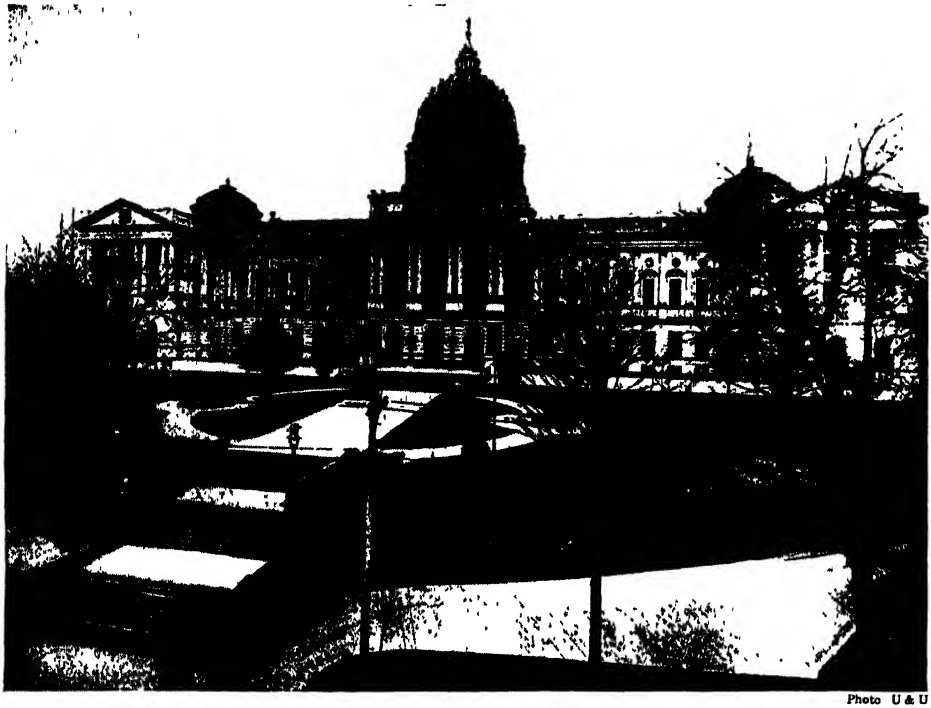


Photo U & U

THE CAPITOL BUILDING, AT HARRISBURG

Others in authority, appointed by the governor, include the secretary of the commonwealth, attorney-general, and superintendent of public instruction, and the secretaries of agriculture, labor and industry, welfare, forests and waters, mines, health, highways, and banking; all hold office for four years.

Judiciary. The judicial department consists of a supreme court and a superior court, each having seven judges; courts of common pleas, of oyer and terminer (courts having higher criminal jurisdiction), general jail-delivery courts, quarter sessions of the peace courts, orphans' courts, and magistrates' courts. All judges are elected by the people, those of the supreme court for twenty-one years, and all others for ten years. In 1913 electrocution was substituted for hanging in cases of capital punishment.

Earliest Settlement. In 1609, six days before he sailed up the river which bears his name, Henry Hudson anchored the gaudily painted *Half Moon* in Delaware Bay. In 1624, about fourteen years later, Cornelis Mey and a band of adventurers built Fort Nassau, on the Delaware River, for the West India Company. Although these claims were slight, the Dutch felt aggrieved when the Swedes began to colonize along the Delaware in 1638, and open conflict resulted. That the early Swedish settlers builded well and prospered is seen in the fact that some of the churches and a seventeenth-century log cabin are still standing in Philadelphia. Their presence is also recorded in the name of many towns near Philadelphia and Chester, such as Swedeland and Swedesburg. In 1664 the British secured the Pennsylvania territory, along with that of New York.

Creation of Pennsylvania. In payment for a debt owed to Admiral Penn, Charles II bestowed a grant of territory west of the Delaware, between 40° and 43°, upon the former's son, William Penn, the Quaker, who wished the domain to be known merely as "Sylvania," meaning *woodlands*. Charles II, however, prefixed the Quaker's name, making it *Penn's Woods*. Penn, with Quaker modesty, protested; whereupon Charles responded, with quick wit, "Not for you, but to commemorate your noble father, the Admiral."

Although Penn was granted absolute feudal rights, his liberal government, religious toleration, and the social freedom of the colony attracted many from European countries, and Pennsylvania became the largest and most successful of the proprietary colonies.

Boundary disputes arose with New York, Connecticut, Maryland, and Virginia, which were not settled for many years. The southern limit of the colony was fixed by the drawing of the famous Mason and Dixon's Line in 1763-

1767, and the arc between Delaware and Pennsylvania. The northern limit was not settled until 1789, when the forty-second parallel was made the boundary between this state and New York. The triangular section on Lake Erie was purchased in 1792.

Boundary disputes with Virginia and Maryland, known respectively as the Dunmore and Cresap wars, continued for many years and did not end until the termination of the Revolutionary War. In the border dispute with Connecticut, the armed conflicts formed a stirring period in Pennsylvania history, that of the first and second Pennamite-Yankee wars. The final termination of this dispute was settled by Congress in 1783, in what is known as the Decree of Trenton.

After Penn's death, petty disturbances in the colony became grave. The impetuous Scotch-Irish settlers on the frontier saw no reason for Quaker peace, nor for fair dealing with the Indians, and after 1775 there was constant conflict with the Indians where formerly there had been peace. The French and Indian War and the claims of Connecticut and Pennsylvania to the Wyoming Valley led to Indian uprisings which resulted in the terrible Wyoming Massacre.

The Revolutionary Period. The outstanding figure in the history of Pennsylvania during the Revolutionary period was Benjamin Franklin. As envoy to England and France, his services to the colonies were of immeasurable importance. He presided over the convention which framed the Pennsylvania constitution; he helped to frame and he signed the Declaration of Independence. He also proudly signed the treaty of peace at Paris, as Postmaster-General, he greatly improved the postal-service system. He later helped to frame the Constitution of the United States, and was one of those who signed it

Though he was an important figure in the scientific research and invention of the period, yet only two years before his death, he wrote—

> I have sometimes wished it had been my destiny to be born two or three centuries hence The present progress is rapid Many [inventions] of great importance, now unthought of, will, before that period, be produced.

In the Pennsylvania of his day, about nine out of every ten men were engaged in agriculture, fishing, or lumbering. Industry was yet in its infancy, boasting only a few small paper mills, iron forges, woolen mills, and glass factories, in which manufacturing processes were simple and performed by hand labor. Mining, save as it served the colonists' simple needs, was unimportant. The farmer and his wife were cobblers, soap- and candle-makers, smiths, and weavers. Franklin's vision of progress is well borne out by the Pennsylvania of to-day, a mining and industrial giant.

The first two Continental Congresses met in Philadelphia except during those months when the city was occupied by the British, when sessions were held at Lancaster and York, both Pennsylvania towns. It was at Philadelphia, in Independence Hall, that the Declaration of Independence was adopted. The state was the scene of the battles of Brandywine, Paoli, Fort Mifflin, and Germantown; near the Schuylkill, nineteen miles north of Philadelphia, Washington's headquarters at Valley Forge during one terrible and memorable winter may still be seen.

In 1787 Pennsylvania adopted the Federal Constitution, the second state to do so. The state played a prominent part in the early history of the United States. Robert Morris and Stephen Girard, both Pennsylvanians, were, with Alexander Hamilton, the great financial figures of this period.

Later History and Development. Tradition says that the deciding vote on the Declaration of Independence was cast by the Pennsylvania delegates; hence Pennsylvania is popularly known as the KEYSTONE STATE. The more probable explanation of this designation lies in Pennsylvania's position at the top of the arch formed by the Atlantic states from New England to North Carolina.

In the crisis of 1861, the position of Pennsylvania as a central state was of vast importance to the Union. At the first sound of war, Pennsylvania fulfilled the hopes of the North and responded with nearly twice its quota of troops, besides which it furnished Generals McClellan, Hancock, and Reynolds and Admirals Porter and Dahlgren. Being close to the field of battle, the state suffered from many raids. On July 1-3, 1863, the greatest battle of the war was fought at Gettysburg, and a year later Chambersburg was raided and burned.

Since 1870 industrial development and prosperity have been remarkable, though frequently interrupted by serious strikes; that at the steel mills at Homestead, near Pittsburgh, in 1892, was one of the gravest industrial disturbances in American history. The reorganization of these mills, one of the greatest tasks in business management, was the work of Charles Schwab, and he became president of the great Carnegie Steel Corporation; only sixteen years earlier, he had been a dollar-a-day worker in the steel plant. In what may be called the Age of Steel, Pennsylvania has played a leading part, as those who read the story of steel and of its giants, Carnegie, Frick, Schwab, and Gates, will discover. The story of steel may serve also as an example of the gigantic progress of this period: the iron manufacturer of colonial days would be astounded at an industry which spends millions to buy railways and steamship lines to bring Minnesota's "iron mountain"

QUESTIONS ON PENNSYLVANIA

(An Outline suitable for Pennsylvania will be found with the article "State.")

Name the most noted battlefields of the state and describe briefly the engagements which took place on them.

Give a popular name for this state, and account for it.

What does the official name mean, and why was it given to the state?

How many states of the American Union are larger than Pennsylvania? How many of these larger states have a larger population? (See list, in article UNITED STATES.)

Did Pennsylvania originally have an outlet on Lake Erie? To what does it owe its possession of a shore line?

What states have a density of population greater than that of Pennsylvania? (See list, in article UNITED STATES.)

How many states surpass Pennsylvania in railroad mileage?

What percentage of the population are of foreign birth or of foreign parentage?

How many of the fifty largest cities in the country are in this state? (See list, in article CITY.) How many of the ten largest cities are in Pennsylvania?

Why did many parents hesitate for a long time to send their children to the free public schools? When was this condition of affairs done away with?

What and where is the Delaware Water Gap? For what is it famous?

What traces of its presence did the great ice sheet of the Glacial Age leave in this state?

How do location and altitude modify the climate in different parts of the state?

How large a proportion of the entire area of the state is in improved farms?

How does the state rank as a mineral producer?

What is the state's most important mineral?

Why was not the discovery of anthracite considered at first as of any importance?

How many states surpass Pennsylvania in total value of manufactured articles?

How did the early history of this state prove that the Indians were capable of keeping faith with any white men who kept faith with them? (See PENN, WILLIAM.)

What are the dangers of deforestation? What is being done to overcome them?

Why has Pennsylvania a large foreign population? Why was its early population composed of more nationalities than that of the New England colonies?

What waterways play a great part in Pennsylvania's commercial importance?

Name four great fuels which Pennsylvania furnishes. Give the state's rank in the production of two.

What was the first use made of petroleum? By whom?

What recent change was made in the administrative affairs of the state?

Name three scientists and a noted artist who were Pennsylvanians.

What two great manufactures of the state have been important since the earliest colonial days?

For what important manufacture does Pennsylvania import the raw materials? From where does the material come?

For whom was the state named? Why was it not named for his son?

Where is the fruit-raising section? Why?

In what branch of technical education has Pennsylvania been a pioneer?

What historic event is brought to mind by mention of "the Shackamaxon elm"?

What relic of that event is carefully preserved in Philadelphia?

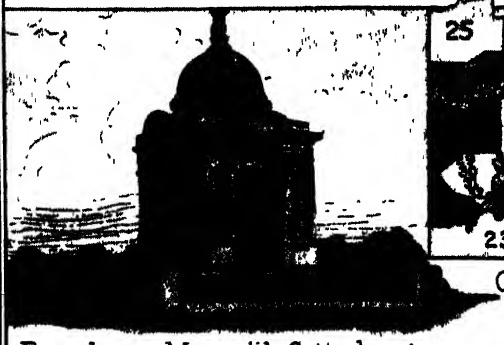
Name the capital of Pennsylvania. In what year was it made the capital?

Where did William Penn live during most of his life, and why did he suffer imprisonment for several years?

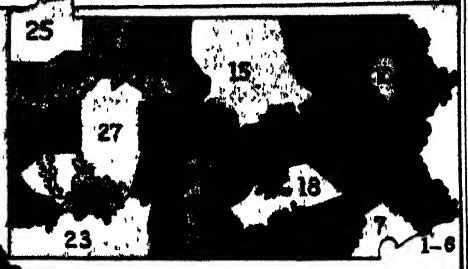
What was the nature of the financial deal by which land in America was granted to William Penn?

What prediction of Benjamin Franklin has been more than fulfilled in the past century of Pennsylvania's history?

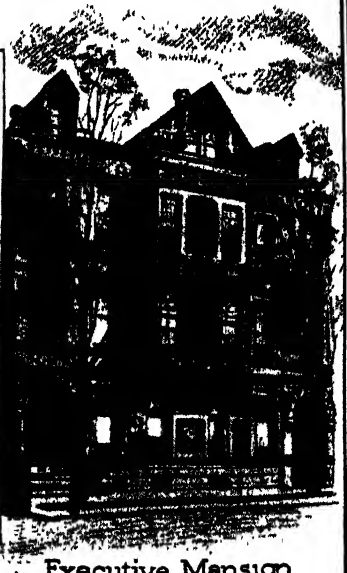
PENNSYLVANIA



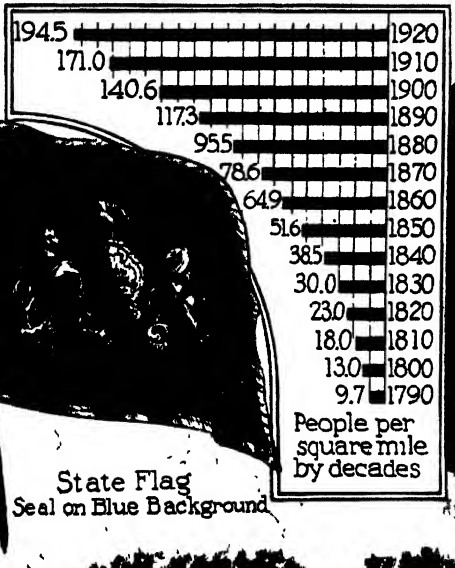
Pennsylvania Memorial, Gettysburg



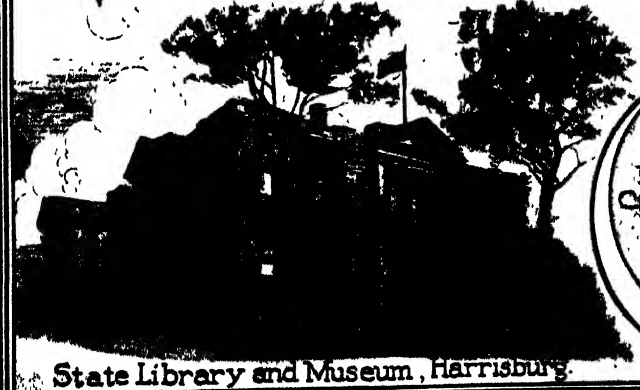
Congressional Districts



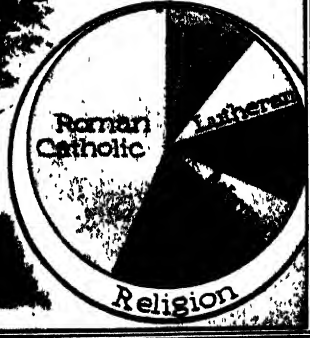
Executive Mansion



State Flag
State Seal on Blue Background



State Library and Museum, Harrisburg



over a thousand miles of land and water to the coal fields and steel mills of Pennsylvania.

A serious general strike of the anthracite miners occurred in 1902; and in 1927-28 a grave situation arose among the miners in the bituminous fields over wages and the conditions of union and non-union labor.

In 1926 the Sesqui-Centennial Exposition, celebrating the hundred-and-fiftieth anniversary of the Declaration of Independence, was held in Philadelphia, fifty years after its great Centennial Exposition.

Other Items of Interest. When Penn made his treaty with the Indians under the Shackamaxon elm, wampum belts were exchanged, according to custom, by the parties to the treaty. The one said to have been given to Penn by the Indians is in the possession of the Pennsylvania Historical Society. Woven into its strings of white and black beads are figures representing an Indian and a European, with hands joined in friendship.

Pennsylvania claims credit for the first book on medical subjects ever written in the United States. The first American hospital was established in Philadelphia in 1751; and the first systematic instruction in medicine was given in Pennsylvania.

The American Philosophical Society, founded in Philadelphia in 1743, was the first scientific society in the country, while Franklin Institute (established in 1824) was the first institute of applied science and mechanic arts.

The Academy of Natural Sciences, founded in 1812, and the oldest institute of its kind, sent out two Arctic expeditions, those led by Kane and Hayes.

Benjamin West, noted artist, one of the founders of the British Royal Academy of Art and its second president, was a Pennsylvania Quaker.

The first permanent theater in America was built in Philadelphia in 1766, and in it was performed the first tragedy with an American setting, *The Prince of Parthia*, written by Thomas Godfrey.

Pennsylvania ranked as a pioneer in prison reform, public charities, and the abolition of slavery; and gave to early scientific research the names of Franklin, of David Rittenhouse, the astronomer, and John Bartram, the botanist.

Related Subjects. The following articles in these volumes contain much additional information as to Pennsylvania:

CITIES

Cities other than those listed below are referred to on the back of the state map.

Allentown	Johnstown
Altoona	Lancaster
Bethlehem	McKeesport
Chester	New Castle
Erie	Philadelphia
Harrisburg	Pittsburgh
Reading	Wilkes-Barre
Scranton	York

HISTORY

Franklin, Benjamin	Valley Forge
Mason and Dixon's Line	Wyoming Valley
Penn, William	Massacre

LEADING PRODUCTS

Buckwheat	Hay
Butter	Iron
Cement	Leather
Cheese	Petroleum
Coal	Potato
Coke	Poultry
Corn	Steel

PHYSICAL FEATURES

Appalachian Mountains	Delaware Water Gap
Blue Ridge	

RIVERS

Allegheny	Ohio
Delaware	Schuylkill
Lehigh	Susquehanna
Monongahela	

PENNSYLVANIAN EPOCH. See CARBONIFEROUS PERIOD.

PENNY, a bronze English coin, equivalent to one-twelfth of a shilling. In a pound sterling ($4 86) there are 240 pennies, and each penny weighs 1/48 of a pound Troy. The equivalent value in United States money is 2.03 cents. The English penny has had its present weight and metal since 1860, when bronze was substituted for silver. The metal is an alloy containing copper (95 parts), tin (4 parts), and zinc (1 part).

The penny is a very old coin, dating from Anglo-Saxon times. Until the reign of Edward I, it was so deeply indented with a cross that it could easily be broken into two or four equal parts, thus giving halfpennies (*ha' pen iz*) and farthings (four things). Its abbreviation is *d*, from its similarity to the Roman coin *denarius* (which see). A German copper coin has a similar name, *pfennig*, and the United States one-cent piece is commonly called a penny. The plural of *penny*, when the value of the coins is considered, is *pence*. See CENT.

PENNYROYAL, a medicinal herb of the mint family, the leaves of which have a strongly pungent odor. The oil yielded by the plant is used in medicine for its stimulating properties. Preparations containing oil of pennyroyal are used to drive away mosquitoes, as its odor is intensely disagreeable to them. The North American pennyroyal grows in fields and woodlands from Cape Breton Island to Florida, and west as far as Nebraska. Its stem, which is branched and hairy, grows from six inches to a foot and a half in height, and bears small, purple flowers that bloom from July to September. This plant, also called *tickweed* and *squaw mint*, is similar in properties to the European species, which is the true pennyroyal. B.M.D.

Scientific Names. Both pennyroyals belong to the family *Menthacea* (or *Labiatae*). American pennyroyal is *Hedeoma pulegioides*; the European species is *Mentha pulegium*.

PENNYWEIGHT. See DENOMINATE NUMBERS (Tables of Weight Measures).

PENOBSCOT, *pe nob' skot,* **RIVER,** the largest stream in the state of Maine. It rises in a small lake near the Canadian border, and after flowing eastward through pine forests, where it widens to form Chesuncook and Pamedumcook lakes, it is joined by the Se-



AMERICAN PENNYROYAL

(1) The stalk, leaves, and flowers (2) Petal of flowers, split down one side and opened out to show interior formation (3) Flower, showing petal and sheath (4) Sheath, split down one side and opened, to show outside formation.

boosis River and flows southward into Penobscot Bay, an inlet of the Atlantic. Although about 350 miles in length, it is navigable for ocean steamers only to Bangor, sixty miles from the sea. However, smaller boats ascend the stream much farther, into a vast lumbering region. In the spring the river furnishes transportation for the logs which are floated for miles down to the sawmills. See MAINE (Lakes and Rivers).

PENSACOLA, FLA. See FLORIDA (back of map).

PENSION, *pen' shun.* This term, which comes to us from the Latin and French words for *paying,* is applied in a broad sense to any sum of money paid to a person at regular intervals. Local governments sometimes pay pensions to widowed mothers; corporations vote pensions to superannuated employees; nations award these payments to citizens who have given special service of a kind that deserves recognition. In some countries, aged persons are supported by regular pensions from the government. Under the titles MOTHERS' PENSIONS and OLD-AGE PENSIONS, in these volumes, two of the foregoing types of compensation are described in detail. This article treats only of military pensions. It is also customary, as an act of courtesy, for Congress to grant pensions to widows of ex-Presidents. These are usually $5,000 a year.

United States. *Revolutionary Period.* The first *disability pensions* (granted to disabled soldiers) followed the Revolutionary War; the first general pension bill was passed in 1792. Various acts of Congress enlarged the terms of the pension law, allowing a larger number of claimants, as they became aged, to receive benefits, and in 1816 an increase in rate was granted, raising a full pension from $5 to $8 a month and extending the benefits to veterans of the War of 1812. In 1818 appeared the first *service pension* (based on the fact of service) for the survivors of the Revolutionary War. It was provided that all who had served to the end of the war, or for a period of nine months during any part of the conflict, should receive a pension, if found needy. Indefinite working of the law made fraud easy, and in 1820 statements to prove dependency were required, and the number of pensions was materially decreased. In 1832 it was enacted that all who had served at least two years in the war should receive full-pay pension for life, and proportional pensions were provided for all who had served less than two years but for more than six months. In 1836 pensions were granted to widows of Revolutionary War soldiers, but for only a period of five years, and conditioned on the fact that the marriage was prior to the last service and that said service was for a period of at least six months. In 1853, all limitations as to time of marriage were swept away. Esther S. Damon, the last widow entitled to a pension under this provision of the law, died at Plymouth Union, Vt., in 1906, 123 years after the close of the Revolutionary War. The total amount in pensions paid by the United States on account of the Revolution was about $70,000,000.

Between the Revolution and War of Secession. The pension regulations for the War of 1812, the Indian wars, and the war with Mexico, 1846-1848, passed through similar historic stages. Service pensions were granted in 1871 on account of the War of 1812, and enlarged in 1878. The pension rolls for 1928 contained the names of fourteen soldiers' widows of the War of 1812; the United States has disbursed as pensions on account of that war more than $46,000,000. Service pensions have been granted on account of the various Indian wars.

Survivors of the Mexican War were granted service pensions in 1887, provided they were sixty-two years of age, dependent, or disabled; honorably discharged; and had served for sixty days. Widows of the Mexican War veterans were also granted a pension. The provisions were rendered more liberal by successive enactments, the last being that of 1912, which

provided that all soldiers and sailors who served sixty days in that war and were honorably discharged should receive $30 per month. In 1928 the pension rolls contained the names of four survivors and 845 soldiers' widows of that war, and the United States has paid out in pensions on account of it more than $58,600,000.

War of Secession. The pension disbursements of the United States on account of the War of Secession, 1861-1865, have been on a scale hitherto unknown in history. The first general-disability pension law on account of that war was enacted in 1862, and benefited only those who were disabled by wounds or disease, or their widows and dependents. The rates varied from $8 to $30 a month according to rank and degrees of disability or dependence. By subsequent acts, these provisions were enlarged, becoming more and more liberal, until in 1890 the first service-pension law was passed. It was, however, of a restricted nature; it provided that all who had served ninety days in the war, and were suffering any disability of a permanent character which incapacitated them for manual labor, would be entitled to a pension, varying in amount from $6 to $12 per month. The provisions of this act were extended by various laws until in 1912 it was enacted that all War of Secession survivors, whether disabled or not, who were sixty-two years old, and had served ninety days, should receive pensions, varying with the age of the survivor and length of service.

In 1918 a pension act provided a minimum of $30 and maximum of $40 a month for soldiers of the War of Secession who had served ninety days, and were honorably discharged, rates varying with age and length of service. By legislation of 1926, those who had served in this war for at least ninety days, with an honorable discharge, were entitled to $65 a month. Provision was made for those who had served less than ninety days and were disabled. Those who have become totally helpless or blind receive $90 a month. Widows are paid $50 a month, an increase from the former $35. The United States had paid out on account of that war, up to 1927, more than $7,100,000,000.

In 1928 the total number on the pension rolls of the United States was 491,194, of whom nearly one-half were widows or dependents. This number includes 191,270 pensioners of the Spanish-American War, including soldiers, nurses, and widows.

World War. When the United States entered the war against Germany, in 1917, a substitute for a pension system was adopted in behalf of soldiers who should be enlisted in service. The government insured the soldier to a maximum of $10,000, at a yearly cost of $7.56 to $8.40 per $1,000; only father, mother, brother, sister, or wife could be a beneficiary.

The United States Veterans' Bureau was created in 1921, and organized to administer all the activities of the World War veterans' relief (see VETERANS' BUREAU, UNITED STATES).

The soldiers' bonus law of 1925 was not a pension act, but served to increase the compensation, by means of a bonus, of the soldiers who had been enlisted in the World War (see SOLDIERS' BONUS).

The Bureau of Pensions. The mass of detail necessarily connected with the pension business is cared for in a special Bureau of Pensions, established in connection with the Department of the Interior. Pension bills are paid every three months through the disbursing department of the Bureau. The magnitude of the business is realized when it is noted that the disbursements on account of pensions in 1928 were over $228,965,672, and that to date the United States has paid out, since its national life began, the enormous sum of over $7,720,500,000.

Other Countries. In Canada the Board of Pension Commissioners was constituted in 1916, and pensions are awarded for disabilities arising from war service, and discontinued only when disability has ceased. Dependents of soldiers dying in service, etc., are entitled to pensions. Pensions as understood in European countries have more to do with the civil service; they are grants made to those who have served the state for a period of years; they are also bestowed as rewards for exceptional services, to scholars who have made important discoveries, or distinguished themselves in literary pursuits. In England there is a small service pension for its soldiers and sailors, depending on length of service, which must cover several years' time, or on the nature of the disability.

PENSIONS, OLD-AGE. See OLD-AGE PENSIONS.

PENTAMETER, *pen tam' e tur.* See METER.

PENTATEUCH, *pen' ta tuke,* meaning *five books,* refers specifically to the first five books of the Old Testament, including *Genesis, Exodus, Leviticus, Numbers,* and *Deuteronomy,* believed to have been originally one work. Scholars now include a sixth book, *Joshua,* and call the whole the *Hexateuch.* These old Scriptures were compiled from three different sets of documents. The first, known as the *Covenant Code,* included the primitive Hebrew narratives and laws; the second, known as the *Deuteronomic Code,* a restatement of the law as it is first found in *Exodus;* and the third, known as the *Priestly Code,* or *Law of Holiness,* found in *Leviticus* and *Numbers.*

PENTECOST, *pen' te kawst,* OR **FEAST OF WEEKS,** a Jewish festival celebrated as a token of thanksgiving for the ingathering of the grain harvest, and also known as the Feast of Harvest. It is observed on

fiftieth day after the Passover, or Feast of Unleavened Bread (see PASSOVER), which marked the opening of the harvest. The name Feast of Weeks refers to its occurrence seven weeks after the second day of the Passover. An offering of two leavened wheaten loaves was made for the community, and individuals brought offerings according to the abundance of their harvest (*Deuteronomy* XVI, 10). Gifts were also made to the Levites and the poor. In later Jewish history, the feast was celebrated to commemorate the delivery of the law on Mount Sinai, believed to have taken place fifty days after the Exodus from Egypt (*Exodus* XIX, 1).

The Christian Pentecost, held fifty days after Easter, celebrates the descent of the Holy Spirit (*Acts* II, 1-4). The name Whitsunday, often given it, refers to the white garments worn on that day by candidates for baptism.

PENTELICUS, MOUNT. See GREECE (Surface and Rivers).

PENTLAND FIRTH. See ORKNEY ISLANDS.

PENUMBRA, *pe num' brah*, a partial shadow cast during an eclipse. The word means *almost in shade.* In the accompanying figure,

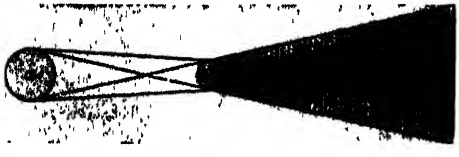


DIAGRAM ILLUSTRATING PENUMBRA

(*a*) the luminous body, the sun, (*b*) the illuminated half of a sphere, which receives light from the luminary. The heavy-shaded lines behind *b* indicate the *umbra*, where practically total darkness prevails. The light-shaded lines represent the *penumbra*, which is in partial shadow.

the more lightly shaded portions show the penumbra. From the darker, cone-shaped figure, rays from the sun (*a*) are cut off by the intruding body (*b*), and a total shadow called the *umbra* results. If the observer is within the penumbra, he sees a partial eclipse. If he is near the dark cone, the obscuring body will almost cover the sun's disk; but if he is stationed near the outer edge of the penumbra, the object will appear to encroach but little on the source of light. In a total eclipse, the observer is within the umbra, and all light is excluded. See ECLIPSE; SHADOW. A.L.F.

PEONAGE, *pe' on ayj*, a system of enforced labor formerly existing in the Spanish colonies in America, particularly in Mexico. The term is derived from the Spanish *peon*, signifying *day laborer*, and originally referred especially to Indians. As the Spanish government exempted Indians from military service and the payment of taxes and tithes, they were excluded from certain political and social privileges and were at the mercy of the Spanish governors.

There were two kinds of peons. The smaller class consisted of those Indians who were paid agricultural laborers, and free to make their own contracts. The second, and much larger class, contained the criminal laborers who, for debt or petty offenses, were condemned to practical slavery. Under corrupt officials, this last class was extended to include most of the Indians. Legally, the system was abolished long ago, but the name *peon* is still used to refer to laborers of Indian or mixed blood who through ignorance are still the victims of abuses.

Peonage in the United States. This Mexican custom at one time existed in the United States territory comprising the present states of New Mexico and Arizona, but was abolished by a national law in 1867. The term, even after the beginning of the twentieth century, was also applied to alleged abuses in the convict-labor system, especially among negro prisoners. Investigations revealed that negroes were arrested on false and vague charges and were fined. If unable to pay the fine, as was usually the case, they were given to the highest bidder to work without wages for a certain period of time; at the end of this period, they might be rearrested and again forced into service. In 1911 the United States Supreme Court declared unconstitutional all laws permitting this practice.

PEONY, *pe' o nie*, the common name of a genus of plants with shrubby or herblike stems, valued by gardeners because of their large, handsome flowers. In the early spring, the clusters of leafy shoots, red and shiny green in



Photo: Visual Education Service

PEONY BLOSSOM

appearance, make a striking effect a few weeks before the flowers appear. The peonies belong to the buttercup family. Many of the cultivated varieties common in America are the offspring of two species of the eastern hemi-

sphere—the *common peony* of Southern Europe and the *white peony* of Siberia. The large, solitary flowers of the common peony are red or crimson, and very striking in appearance, though lacking in fragrance. Many of the *Chinese peonies*, a large group of hybrids, bear double-flowered, sweet-scented blossoms. Large species of the peony group are called tree peonies, and of this division, the best-known is a native of Japan and California. Its showy blossoms, presenting a wide range of white and rose-colored hues, are borne on a stalk from three to four feet high. Tree peonies usually need considerable care and are typical greenhouse plants. The herbaceous forms are grown usually by division of the shoots. Once established, they bloom season after season. B.M.D.

Scientific Names. Peonies belong to the family *Ranunculaceae*. The common species is *Paeonia officinalis*; the white Siberian, *P. albiflora*. Tree peonies grown in America are chiefly *P. moutan* and *P. lutea*.

PEOPLE'S PARTY, in the United States, the official name of a political organization better known as the *Populist* party. A member of the People's Party was called a Populist, and in time the party itself was commonly called by that name. See POPULIST PARTY.

PEORIA, *pe o' ri ah*, ILL., second only to Chicago in size among the cities of the state, is the county seat of Peoria County. It is situated 150 miles southwest of Chicago, on the scenic highway between that metropolis and Saint Louis, Mo. The city is noted for its production of commercial solvents, and is also one of the important corn markets of the country. Population, 1928, 84,500 (Federal estimate).

Peoria covers an area of ten square miles and has eight miles of river front on the Illinois River, here expanded into Peoria Lake. Thus there is navigation to the mouth of the river and to La Salle, to the north, where connection is made with the Illinois and Michigan Canal, extending to Chicago. The business and manufacturing sections are built along the river, while the residential districts for the most part occupy the surrounding bluffs. There are more than 1,200 acres of improved parks and drives for recreation devotees, exclusive of private club grounds and golf parks. Grand View Park winds along a circuitous route on the edge of the bluffs overlooking the Illinois Valley, in full view of Lake Pimiteoui. East Peoria's scenic drive also skirts the bluffs overlooking Peoria and the lake. A monument in the Peoria County Courthouse Square marks the spot where one of the famous Lincoln-Douglas debates was held.

Transportation. Peoria is served by fourteen steam railroads, including the Atchison, Topeka & Sante Fe; Chicago & Alton; Chicago & North Western; Illinois Central; Nickel Plate; Chicago, Rock Island & Pacific; Pennsylvania; Toledo, Peoria & Western; and Peoria & Pekin Union. There is interurban service to Bloomington, Decatur, Springfield, Saint Louis, and intermediate points. Motorbus and truck lines operate between Peoria and surrounding towns, as well as between Peoria and Chicago.

Industries. Situated in the center of agricultural Illinois, Peoria is noted for the manufacture of a varied line of agricultural implements. It is the recognized center of the pure-bred-hog industry, and the home of the National Swine Show In addition to being an important corn market, it is a large retail and wholesale producing point, from which articles are shipped to every state in the Union. Aside from agricultural implements, the chief articles of manufacture include washing machines, commercial drugs and chemicals, furnaces, cigars, stock feeds and grain-food products, wire fencing, cordage, cooperage, and alcohol. Peoria is the center of a vast bituminous coal field. Coal mines abound in all directions from the city limits. Deposits of shale and clay have been tapped at various points within the industrial area.

Institutions. In addition to its public-school system, Peoria has two colleges—Bradley Polytechnic Institute and Spalding Institute. It maintains three public libraries of general scope, with over 150,000 volumes in the combined system, and its Little Theater is nationally known The city's municipal recreation commission sponsors organized recreational activities in the public parks, schools, and juvenile playgrounds.

History. The name *Peoria* comes from the Indians, and was used to designate a trading post on the site of the present city as early as 1700. In 1812 the French fur traders who had settled there were driven out because of their suspected treachery in connection with Indian troubles. A permanent settlement was made in 1819, which was incorporated as a town in 1835 and as a city in 1845.

Prominent among Peoria's citizens were Robert G. Ingersoll, Emma Abbott, prima donna, George Fitch, humorist, and Archbishop Spalding. M.J.F.

PEPIN, OR PIPPIN, the name of several officers prominent in the early history of France who bore the title of *mayor of the palace*, but had in reality the authority of kings. PEPIN THE ELDER, who died in 639, virtually ruled the kingdom during the reign of the weak Merovingian king Dagobert I. His grandson, PEPIN OF HERISTAL (died 714), was appointed mayor of the palace over the eastern part of the kingdom only, but finally succeeded in gaining control of the whole country. A natural son of Pepin of Heristal was the famous Charles Martel (which see). The latter's son, Pepin the Short, ruled from 751 to 768.

Pepin the Short (714-768), like his predecessors, began his career as mayor of the palace. The people had come to recognize the utter feebleness of the Merovingian kings, and in 751 Pepin was able to depose King Childeric and have himself crowned king. He was the first of the Carolingian dynasty



PLANTS WHICH PRODUCF THE BLACK PEPPER OF COMMERCE

(see CAROLINGIANS) In two invasions of Italy, he overthrew the Lombards, and by giving to the Pope the lands which he took from them, he laid the foundation for that temporal sovereignty of the Papacy (see PAPAL STATFS) which had such varied consequences in European history. Pepin was succeeded by his son Charlemagne (which see) Of him it can truthfully be said that he was the son of a great father and the father of a great son.

PEPLOS. See DRESS (The Evolution of Dress).

PEPPER. The familiar black pepper known in every household is the product of a trailing or climbing shrub cultivated in the East Indies and other tropical regions. Java and Madura furnish nearly two-thirds of the pepper used in American homes; the United States imports close to 25,000 tons of this spice annually. The plant bears a small green berry about the size of a pea, which turns red on ripening. The berries are gathered just when they begin to change color, and are then cleaned and dried, the latter process taking place in the sun, or before a slow fire. In drying, the berries turn black, and when ground and sifted, they form the black pepper of commerce.

White pepper is obtained from the ripe berries of the same plant. These are bruised, then washed until freed from the pulpy matter and bits of stalk, and finally dried. White pepper, though it has a finer flavor than black, is not so pungent. Red pepper is obtained from species of capsicum (which see), and the so-called Jamaica pepper (see ALLSPICE) from the pimento tree.

The sharp, biting taste of ordinary pepper is due chiefly to an acrid resin and an acrid oil. Though used principally for seasoning purposes, this spice has medicinal value, and is sometimes taken as a remedy for flatulence, or gas on the stomach. B.M.D.

Scientific Name. The pepper family is known to botanists as *Piperaceae.* The scientific name of the black-pepper shrub is *Piper nigrum.*

PEPPERELL, COLONEL WILLIAM. See LOUISBURG (First Siege of).

PEPPERGRASS. See CRESS.

PEPPERIDGE, a North American tree of the dogwood family, known also as *tupelo, sour gum,* and *black gum.* Its range extends from Maine to Florida and as far west as Ontario and Texas. It has a preference for wet or swampy places. The pepperidge is a distinctive and beautiful tree, and is often planted as an ornamental. It has a tapering trunk from near the top of which the rather short branches extend horizontally.

The closely crowded dark-green leaves, shining above and paler beneath, are arranged al-

ternately. In autumn they make a brilliant showing in the woods, with their scarlet or scarlet and yellow coloring. In the fall, too, appear clusters of small dark-blue berries. They are very sour, but are eaten by the birds. The wood of the pepperidge has a twisted arrangement of fibers, and so is difficult to split, though it decays in contact with soil. It is used for wheel hubs, tools, and for dock framework. G.M.S.

Its Names. The tree belongs to the family *Cornaceae*; its botanical name is *Nyssa sylvatica*. It is called pepperidge chiefly in New England; tupelo is an Indian name. Sour gum refers to the acid fruit, and black gum to the dark-gray bark.

PEPPERMINT, a perennial herb of the mint family, cultivated extensively for a pungent oil produced in glands of the leaves. This oil, the widely used peppermint of commerce, is valuable medicinally and as a flavoring. As alleviations for colic and toothache, peppermint preparations are well known. Menthol, derived from the oil, is a valued remedy for colds and croup. Peppermint is also used in perfume and soap manufacture. The oil is probably the most popular of all flavorings used in candy-making, a careful estimate showing that sixty times as much peppermint is used as wintergreen, and four times as much peppermint as spearmint (which see). Peppermint oil is obtained by means of pressure and distillation. In America, Saint Joseph County, Mich., is the great center of the peppermint industry; the state produces about one-half of the world's supply of oil, and nine-tenths of the American output.

The plant grows from one to three feet high, and bears smooth, sharp-pointed oval leaves and small bluish-white flowers. It is cultivated in England and in various sections of continental Europe; in the United States the peppermint sections outside of Michigan are in New York and Northern Indiana. (See illustration of peppermint in full-page picture under MICHIGAN.) B.M.D.

Scientific Name. Peppermint belongs to the family *Menthaceae* (or *Labiatae*) Its scientific name is *Mentha piperita*.

PEPPER TREE, a tree usually of medium size, so called from its clusters of pungent red berries. Pepper trees have no proper connection with the familiar spice plant. One species, a rapidly growing tree which reaches a considerable size, is cultivated extensively in California. The long, feather-like, saw-toothed leaves are filled with a volatile oil stored in cells which look like holes when held up to the light. After rain they fill the air with fragrance, and when thrown into water, the resinous fluid escapes in jets with such force that the leaves jump around as if alive. The flowers are white, the fruit a small pea-like drupe enclosing a single seed. The resin is used in Peru for medicinal purposes. G.M.S.

Scientific Name. Pepper trees belong to the cashew family, *Anacardiceae*. The species described is *Schinus molle*.



Photo Visual Education Service

CALIFORNIA PEPPER TREE
Branch, with fruit and leaves

PEPSIN, a ferment found in the gastric juice, which has the property of converting proteins (tissue-building foods) into peptones. In chemical composition, it is not greatly unlike the ferment of saliva, *ptyalin*, but its effects are entirely different. It acts in the presence of a weak acid, whereas ptyalin responds better to a slightly alkaline medium. Pepsin has no effect upon fats or carbohydrates. It is produced commercially by drying the mucous lining of the stomachs of pigs and calves, and is then used to aid digestion by those suffering from ailments due to the absence of hydrochloric acid. The pepsin procured from the stomach of the pig is preferred. There are several commercial preparations of pepsin on the market.

Related Subjects. The reader is referred in these volumes to the following articles:

Fermentation	Pancreatin
Food (Chemistry of Foods)	Peptones
Meat and Meat Packing (Products and By-Products)	Proteins
	Stomach

PEPTONES. In the process of digestion, protein foods (such as lean meat, white of egg, peas, and beans) are acted upon by the ferment *pepsin* of the gastric juice, and the ferment *trypsin* of the pancreatic juice. These ferments change proteins into compounds called *pep-*

tones; the latter have the power to pass through membranes and so can be absorbed from the alimentary canal, while ordinary proteins cannot. The change from proteins to peptones is only for the purpose of absorption, for in the walls of the intestine, the products of protein digestion are recombined to form tissue-building compounds that are taken up by the blood vessels and the lymphatics. There are on the market several preparations of predigested foods, known as beef peptones, milk peptones, etc. These are designed for convalescents and dyspeptics. Commercial peptones consist largely of proteoses, which represent an earlier stage in the change of proteins into peptones.

PEPYS, *peeps, pep' is,* or *peps,* SAMUEL (1633-1703), an English official who is remembered to-day only because he kept a diary that has become a classic. He was born in London and educated at Saint Paul's School and at Cambridge. Through the influence of Sir Edward Montagu, he was given a clerkship in the navy, and subsequently was made secretary of the admiralty. A few years later, Pepys was accused of sharing in the conspiracy to overthrow Charles II and the power of Protestantism The charge having been disproved, he was soon released without a trial and again given his office in the admiralty, which he kept until 1689, when William and Mary came to the throne. Thereafter he lived in retirement. Pepys gave to Magdalene College, Cambridge, a library formed, in part, of a large number of old English ballads. He left memoirs of his experiences in the navy, but all of his achievements are overshadowed by the celebrated *Diary.*

Pepys' Diary. Worldly-wise Pepys, clerk of the navy office and great lover of music, in his *Diary* chronicles events as he saw them during nine years of his active life—from 1660 to 1669—with an honesty, exactness of detail, and an unconscious humor that make it unique in world literature He not only deals with events in the reign of Charles II, but with personal incidents in his own life which make it very evident that he intended the *Diary* for himself alone. He not infrequently portrays himself as an odious, greedy, cowardly individual with whom his pretty wife has a very trying time, indeed. Among lapses to which he confesses were kicking his cook, kissing his maids, and blacking his wife's eye; and it was a matter of great annoyance and concern when others found out what he had done His eyes were weak. However, he wore dark-colored glasses not only to protect them, but that his wife, when upbraiding him for some misconduct, would not read his guilt in his eyes. Despite his many faults, in his unconscious manner he also reveals acts of kindness and generosity which at times make one overlook his gross temperament, nefarious business transactions, and base ambition.

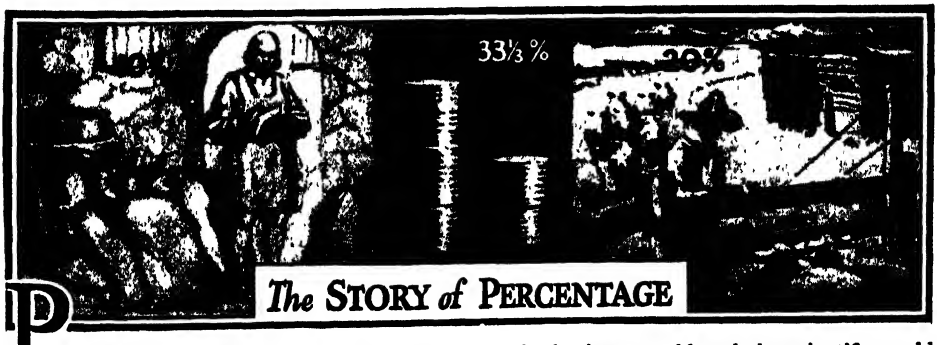
His work at the navy office gave him great opportunity for keen observation in the world beyond his home, and his comments and fund of anecdotes make up a human document of rare vitality The diary was written in small handwriting in six volumes He used a system of shorthand, which he amplified by his own character inventions and by using foreign languages. The manuscript was deciphered by John Smith, rector of Baldock in Hertfordshire, between 1819 and 1822. The first and partial edition, edited by Richard Neville Griffin, was published in two volumes in 1825; another two-volume edition appeared in 1828; and subsequently several new and enlarged editions. The standard edition, in nine volumes, is by H B Wheatley, with a supplementary volume of *Pepysiana.* In 1928 *Pepys' Diary* was dramatized under the title *And So To Bed,* a phrase which Pepys frequently used in his inimitable self-revelations.

PEQUOT INDIANS. See UNCAS; INDIANS, AMERICAN (Most Important Tribes).

PERA, *pa' rah,* Constantinople's foreign quarter. See CONSTANTINOPLE.

PERAK, *pay rahk',* one of the four governments of the Federated Malay States (which see).

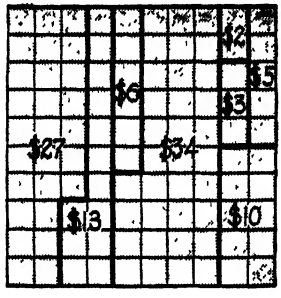
PERCALE, a cotton fabric, closely woven and printed with a stiff finish. It is finer but heavier than calico, and wider. Percale is used for dresses, aprons, blouses, and men's shirts, and comes in widths of twenty-seven, thirty-two, and thirty-six inches.



PERCENTAGE, *pur sen' taje,* the process of computing by hundredths. The word is from the Latin *per,* meaning *by,* and *centum,* meaning *hundred.* The symbol for per cent is %.

The business world and the scientific world use per cent to express the number relations in which they are interested, instead of using the common fractions, halves, thirds, fourths, etc.

This is not altogether a modern innovation, for we find that percentage was in use in centuries past. In the seventeenth century, for instance, La Salle, in his early settlement in Canada, took "6 measures out of every 100 measures" sent to him, which he had ground. Reckoning so many out of 100 has seemed a simple method of designating parts. Today, it is the general method of keeping records of scientific experiments, business ventures, and tests for efficiency in all lines. Thus we find expressed in per cents the humidity of the atmosphere, the relative values of foods, the proportions of materials in soils, the relative value of money investments, the relative efficiency of men as workers and of teams as ball players, results of sociological research, birth rates, statistics as to fatalities resulting from various diseases, death rates, etc.



Illustrative Examples. A young man spent $100 for a vacation trip. He paid $27 for railroad fare; $13 for steamer fare; $6 for meals while traveling; a $34 hotel bill; $3 for transfer of baggage; $2 for reading matter; $5 for taxi fares, and $10 for amusements.

He spent $27 out of $100, or $^{27}/_{100}$, or 27 per cent, of his money for railroad fare. He spent $13 out of $100, or $^{13}/_{100}$, or 13 per cent, of his money for steamer fare. This may be tabulated as follows:

Railroad fare	=	27% of $100
Steamer fare	=	13% of $100
Meal bill	=	6% of $100
Hotel bill	=	34% of $100
Baggage bill	=	3% of $100
Reading bill	=	2% of $100
Taxi bill	=	5% of $100
Amusement bill	=	10% of $100
		100% of $100

Finding Any Per Cent of a Number. Find 1% of the following: $600; $300; $1500; 900 miles; 12,000 feet; 1600 bushels.

Find 2% of each of the above; find 7% of each.

1% of $600 = $6.00 = $ 6
2% of $600 = 2×$6 = $12

1% of 900 mi. = 9.00 mi. = 9 mi.
7% of 900 mi. = 63 mi.

To find one per cent of a number, divide it by 100. Do this in the shortest way, which is to move the decimal point two places to the left.

Find 1% of the following: 1250, 730, 280, 175, 125, 936, 24, 16, 8, 3, 11.5, 12.65, .84, 96, 7.

Find 8% of each of the above.

1% of 1250 = 12.50 = 12.5
8% of 1250 = 8×12.5 = 100.

1% of 24 = .24
8% of 24 = 8×.24 = 1.92

1% of 3 = .03
8% of 3 = .24

1% of 11.5 = 115
8% of 11 5 = 8×.115 = .92

1% of .84 = .0084
8% of .84 = 8×.0084 = .0672

To find any per cent of a number, move the decimal point two places to the left and multiply by the number denoting the per cent to be found; or *multiply by the number denoting the per cent, and point off the product*, thus:

6% of 725 = *n*; 12% of 8.3 = *n*

725	8.3
.06	.12
43 50	.996

Practical Problems. (1) A 20-acre field yielded 480 bushels of corn one year; the following year its yield was increased $7\frac{3}{8}$%. What was the value of the increase, corn selling at $1 per bushel?

First crop = 480 bu.
Number bu increase = .07⅜×480 = 35.40
Value of increase = 35 40×$1 = $35 40

(2) Sugar sold at 6½ cents per pound; it rose in price 50%. For what did it sell then?

First selling price = 6½¢
Increase = 50×6½¢ = 3¼¢
Second selling price = 6½¢+3¼¢ = 9¾¢

(3) Living expenses rose 35% from January to July. What salary should a man receive in July, who in January was getting $24 a week, so that the increase in salary will correspond to the increase in expenses?

(4) A school district receives $788.50 one year for expenses. The state pays 28% of it, the county 32% of it, and the district the rest of it. How much does each pay?

Whole tax = $788.50
State tax = .28×$788.50 = $220.78
County tax = 32×$788.50 = $252.32
District tax = (1 00−.60)×$788 50 = $315.40

(5) If wheat selling at $1.90 falls 10%, for what does it sell?

(6) A record jump was 12 feet 9 inches. An athlete breaks the record by an increase of 2%. What is his jump? Answer, 13 feet .06 inches.

First record = 12 ft. 9 in.
Increase = .02×(12 ft. 9 in.) = .24 ft.+.18 in.
New record = 12.24 ft.+9.18 in.
.24 ft. = .24×12 in. = 2.88 in.
New record = 12 ft.+2.88 in.+9.18 in. = 13 ft.+.06 in.

[The .06 in. is discarded in giving the answer, as it is too small to measure in jumping.]

Finding What Per Cent One Number Is of Another. Note the following:

$2 is what part of $8? ¼
$4 is what part of $8? ½
$3 is what part of $8? ⅜
$6 is what part of $8? ¾
$7 is what part of $8? ⅞

Express the above answers in hundredths:

$$¼ = {}^{25}/_{100},\ ½ = {}^{50}/_{100},\ ⅜ = \frac{37½}{100},$$

$$¾ = {}^{75}/_{100},\ ⅞ = \frac{87½}{100}$$

Express with the symbol %:

$2 is 25% of $8
$4 is 50% of $8
$3 is 37½% of $8
$6 is 75% of $8
$7 is 87½% of $8

Common fractions may be expressed with the per cent sign:

⅕ = 20%, ⅖ = 40%, ⅗ = 60%, ⅘ = 80%, ⅓ = 33⅓%, ⅙ = 16⅔%, ⅒ = 30%, ⅛ = 11⅛%, ⅞ = 28⅝%, ⅛ = 12½%, 1/12 = 8⅓%, 1/16 = 6¼%.

(Refer to DECIMAL FRACTIONS for reduction of common fractions to decimal fractions.)

Any fractional part can be expressed as hundredths and therefore as per cent, as shown below:

135 trees in an orchard of 180 trees are cherry trees, 18 are plum trees, and the rest are peach trees. What per cent of the orchard is cherry trees? Plum trees? Peach trees?

Number trees = 180
Part cherry = ${}^{135}/_{180} = ¾ = 75\%$
Part plum = ${}^{18}/_{180} = 1/10 = 10\%$
Part peach = ${}^{27}/_{180} = 3/20 = 15\%$

This follows very simply from work in common fractions; *we find what part one number is of another, and express that part in hundredths or per cent.*

Practical Problems. (1) A gardener planting 40 acres of land put 7 acres into sweet corn, 15 acres into potatoes, 13 acres into tomatoes and 5 acres into lettuce, radishes, etc. What per cent of his land is given to corn? Potatoes? Tomatoes? Lettuce?

$$\text{Part to corn} = {}^{7}/_{40} = \frac{7.00}{40} = 17½\%$$

$$\text{Part to potatoes} = {}^{15}/_{40} = \frac{3.00}{8} = 37½\%$$

$$\text{Part to tomatoes} = {}^{13}/_{40} = \frac{13.00}{40} = 32½\%$$

$$\text{Part to lettuce} = {}^{5}/_{40} = 1/8 = 12½\%$$

(2) A man receives a salary of $135 a month. He pays per month $25 for rent, $36 for food, $15 for clothes. What per cent of his salary does he pay for each?

$$\text{Part for rent} = {}^{25}/_{135} = \frac{5.00}{27} = 18\tfrac{1}{27}\%$$

$$\text{Part for food} = {}^{36}/_{135} = \frac{4.00}{15} = 26⅔\%$$

$$\text{Part for clothes} = {}^{15}/_{135} = \frac{1.00}{9} = 11⅑\%$$

(3) 2,800 pounds of milk from one dairy gave 84 pounds of butter fat; 2,400 pounds from another dairy gave 84 pounds of fat. What per cent butter fat did the milk from each dairy give?

Number lb. of milk = 2800
Number lb of fat = 84
Part fat = ${}^{84}/_{2800} = 3/100 = 3\%$
Number lb of milk = 2400
Number lb. of fat = 84
Part fat = ${}^{84}/_{2400} = 7/200 = 3½\%$

(4) 4 inches is what per cent of 1 foot?

$$\text{Part} = 4/12 = 33⅓\%$$

(5) 3 pecks is what per cent of 6 bushels?

$$\text{Part} = 3/24 = 1/8 = 12½\%$$

(6) A baseball team during one season won 83 games and lost 57 games. What was the per cent of games won? Carry to one decimal place.

Number games played = 83 + 57 = 140

$$\text{Part won} = {}^{83}/_{140} = \frac{83.000}{140} = 59.2\%$$

(7) $6 is what per cent of $12?
(8) 1 pint is what per cent of 1 quart?
(9) 3 pecks is what per cent of 1 bushel?
(10) 3 inches is what per cent of 1 foot?
(11) 2 ounces is what per cent of 1 pound?
(12) 9 inches is what per cent of 1 yard?
(13) 1 foot 9 inches is what per cent of 14 feet?
(14) 6⅔ miles is what per cent of 20 miles?
(15) A farmer raised corn last year on 68 acres. This year he adds 17 acres to his corn field. What per cent has he increased it?
(16) The drainage tax of some farm land along the Illinois River last year was $45 per acre. This year it is $60 per acre. What is the per cent of increase?

First tax = $45
Increase = $15
Rate of increase = ${}^{15}/_{45} = 1/3 = 33⅓\%$

Finding a Number When a Per Cent of It Is Given. (1) 25% of Mr. Howard's farm is 78 acres. How many acres in the whole farm?

.25 of farm = 78 A.
Number A. in farm = 4 × 78 = 312

(2) 60% of Mr. Howard's crop of wheat last year was 7,488 bushels. How many bushels in his entire crop?

.60 of crop = 7488 bu.

$$\text{Bu. in crop} = {}^{3}/_{5} \text{ of } 7488 = 12480$$

or

⅗ of crop = 7488 bu.

$$\text{Bu. in crop} = \tfrac{6}{10} \text{ of } 7488 = 12480$$

or

$$.60 \times \text{crop} = 7488 \text{ bu.}$$

$$\text{Bu. in crop} = \frac{7488.00}{.60} = 12480$$

Note in the last solution that 7,488 is the product of the number of bushels in the whole crop and .60.

When the product of two numbers and one of the numbers are known, the other number is found by dividing the product by the number that is known. This principle runs through percentage in every division of the subject, interest, commission, profit and loss, and so forth. The following problems illustrate this:

(1) What sum of money on interest at 5% for 1 year gives $337.50 interest?

$$.05 \times \text{principal} = \$337.50$$

$$\text{Principal} = \frac{337.50}{05} = \$6750$$

(2) A commission agent working at 13½% earned $1687.50 selling machines. What was the amount of his sales?

$$.13\tfrac{1}{2} \times \text{sales} = \$1687.50$$

$$\text{Sales} = \frac{\$1687\ 500}{135} = \$12500$$

(3) A baseball team lost 32 games in one season and their per cent loss was 45⅝. How many games did they play?

$$.45\tfrac{5}{8} \times \text{number} = 32$$

$$\text{Number} = \frac{32.00}{.45\frac{5}{8}} = \frac{3200}{45\frac{5}{8}} \times \frac{8}{1} = 70$$

A kind of problem arises in percentage which seems to *differ* from the problems just dealt with, but which is really the *same kind of problem*; for example:

(1) Mr. Jackman sold flour at $11.60 per barrel, which was a gain of 16% to him. What did he pay for it?

$$\text{Cost} + .16 \text{ of cost} = \$11.60$$

$$1.16 \times \text{cost} = \$11.60$$

$$\text{Cost} = \frac{\$11.60}{1.16} = \$10$$

In this problem $11.60 is 116% of the cost, and is therefore the *product* of 1.16 and the cost, and the *cost* is found by dividing the *product*, or $11.60, by 1.16, the *known factor*.

(2) An athlete's weight is 156 pounds, which shows a loss of 10% from his former weight. What was his former weight?

$$.90 \times \text{former wt.} = 156 \text{ lb.}$$

$$\text{Former wt. in lb} = \frac{156.00}{.90} = 173\tfrac{1}{3}$$

(3) I sold 2 cows for $132 each. On one I gained 20% and on the other I lost 20%. Did I gain or lose on the sale? How much?

$$\text{Cost} + .20 \text{ cost} = \$132$$

$$1.20 \times \text{cost} = \$132$$

$$\text{Cost of first cow} = \frac{132.00}{1.20} = \$110$$

$$\text{Cost} - .20 \text{ cost} = \$132$$

$$.80 \times \text{cost} = \$132$$

$$\text{Cost of second cow} = \frac{\$132.00}{.80} = \$165$$

$$\text{Net loss} = \$275 - \$264 = \$11$$

This may be solved in common fractions:

$$\tfrac{5}{8} \text{ of cost of first cow} = \$132$$

$$\text{Cost of first cow} = \frac{5}{1} \text{ of } \$\tfrac{132}{22} = \$110$$

$$\tfrac{3}{8} \text{ of cost of second cow} = \$132$$

$$\text{Cost of second cow} = \frac{5}{1} \text{ of } \$\tfrac{132}{33} = \$165$$

$$\text{Net loss} = \$275 - \$264 = \$11$$

Problems in interest, commission, profit and loss, discount, taxes, insurance, and so on, come under one of the three divisions of percentage discussed here: (1) To find any per cent of any number. (2) To find what per cent one number is of another. (3) To find a number when a certain per cent of it is known. J.W.Y.

PERCEPTION, *pur sep' shun.* The mind is awakened to activity through impressions brought to it by the senses. Perception is the process of interpreting these impressions. Perception and observation are very much the same. The relation between perception and sensation is so close that we cannot separate them. Sensations grow into perceptions. A mere impression of color or sound is a sensation; that sensation interpreted becomes a perception, or a percept. For instance, a red ball passing before the eye produces a sensation of red upon the retina. If no attention is given it, the observer does not know whether the sensation was caused by a ball or some other object. If attention is given this sensation, however, the observer at once interprets it in the light of former experiences. He recognizes its form and size, compares the object with other similar objects that he has observed before, and decides that it is a ball. Perception, then, is sensation plus experience.

The growth of perception is very slow in young children, and their crude and ridiculous ideas are due to lack of experience. Perception is a progressive process, and the child corrects his ideas as his experience broadens. We have different ideas of the same object because we have had different experiences, and each person interprets each new impression in the light of his own experience. Many city children have no knowledge of the source of milk, beyond the bottle in which it is delivered at the home. A country child has no better idea of the streets, buildings, and other intricacies of a great city. Experience with country life is necessary for the city child, and experience

with city life is equally necessary for the country child.

Training in Perception. Complete perception involves the use of all the senses that can be brought to bear upon an object. In order to get a complete idea of an orange, for example, the child must see it, handle it, taste it, and smell it. If he looks at the orange, it will be nothing more than a yellow ball to him. Parents and teachers often rely too much upon the eye in teaching young children. The child's instinct to handle things is not purposeless, since he gains ideas through the sense of touch that he can gain in no other way. Each sense should be trained. One of the chief educative values of kindergarten occupations, drawing and manual-training exercises in the grades is that they enable the pupil to handle and fashion material, and in this way to extend his powers of observation.

Another point that should also be remembered is that the child observes only one or two features of an object at one time; therefore repeated observations are necessary to gaining a complete idea. It is often advisable to direct the child's observation to some particular feature that he has previously overlooked.

Children and adults alike are prone to see what they expect to see; therefore anticipation is an important factor in training the observation. People often entertain erroneous ideas because of preconceived notions they have formed concerning objects they have never observed. Therefore a description of a new object before it is presented is sometimes helpful, especially if the object is complex. In this description, emphasis should be placed on the features to which the child's attention should first be attracted.

Illusion and Hallucination. Illusions and hallucinations sometimes exert a strong influence over one's perceptions. The moon when near the horizon, for instance, appears larger than when it is near the zenith, and objects seen through a fog often appear to be greatly enlarged. The imagination is also a strong factor in the formation of ideas. Children who are told that the "bad man" will get them, or that all sorts of dire monsters are lurking in dark corners, ready to pounce upon them if they do not behave, are constantly "seeing things" in the dark. The mere mention of such a practice is enough to lead those in care of small children to realize its evil consequences. C.E.S.

Related Subjects. Perception is closely related to the following subjects, all of which are treated in these volumes

Apperception	Hallucination
Attention	Imagination
Concept	Optical Illusion
Eye	Senses, Special

PERCH, a family of about 125 species of fresh-water fish, distributed in the cooler parts of the northern hemisphere. The perches have elongated bodies, either flattened or round, and small, rough scales. A perch may be taken as a representative *Teleost* (the group that includes ordinary bony fishes; that is, typical fishes). Two species well known to American anglers are the *pike perch* and the *yellow perch.* The former, called locally *wall-eyed pike, salmon, jack salmon, blowfish, pike, dory,* and other more or less appropriate names, is found abundantly throughout the Great Lakes region, and in many streams and lakes in the Mississippi Valley, especially those with clear water and rocky or sandy bottom. Individuals vary considerably in size, the largest specimens being three feet long and weighing twenty-five pounds. Those caught in the Great Lakes, however, are not usually over ten pounds in weight, and others are not more than two pounds. The prevailing color also varies, being yellow, gray, or blue. The flesh is very agreeable and is firm and white. At Put-in-Bay, on Lake Erie, the United States Fish Commission has an important hatchery for the propagation of the pike perch.

The yellow perch, also abundant in the Great Lakes region, and in the lakes of New England and New York, is found as far north as Nova Scotia and the Saint Lawrence River, and it also inhabits most of the smaller lakes of the upper Mississippi Valley. The average fish is from six to seven inches long. In color it is a golden-yellow, of varying brightness; the sides are marked with several dark bars. L.H.

Scientific Names. The pike perch is *Stizostedion vitreum,* the yellow perch is *Perca flavescens.*

PERCIVALE, SIR. See HOLY GRAIL.

PERCUSSION, *pur kush' un,* **METHOD.** See WELL BORING.

PEREKOP, *pa ra kawp',* ISTHMUS OF. See CRIMEA.

PERENNIALS, *pur en' ih alz,* are plants that live and blossom for more than two years, sometimes, as in the case of trees, year after year, or indefinitely. Plants whose life span is two years or two growing seasons are called *biennials,* and those which live a single year are called *annuals.* This classification, however, is not hard and fast, for the above-ground parts of some plants are annual, while those below the soil are perennial. Some shrubs and herbs, such as the castor-oil plant, are perennials in their native habitat; nevertheless, when grown in cold climates, they live but a year. Therefore the term *perennial* is most commonly used to designate plants all parts of which endure for more than two years. B.M.D.

Related Subjects. The reader is referred in these volumes to the following articles.

Annuals	Plant
Biennials	Weeds
Botany	

PÉREZ, *pa' rayth,* JUAN. See OREGON (History· Exploration and Early Settlement).

PERFECTIONISTS, *pur fek' shun ists.* See ONEIDA COMMUNITY.

PERFUME, *pur' fume.* As far back as we can trace religious ceremonies, we find that perfumes, usually in the form of incense, were associated with them, and it is probable that from this association arose the ancient custom of presenting aromatic gums as a token of esteem for the one to whom they were given. Be this as it may, perfumes have been held in high regard in all ages, and their manufacture to-day may be considered as one of the fine arts.

The making of perfumery is one of the arts in which the American republic has never excelled. The Old World is drawn on for the millions of dollars' worth of perfumes used every year in the United States—Cyprus, China, Peru, Burma, Zanzibar, and especially France. The industry is gaining headway in America, however, particularly in the direction of synthetic, or artificial, perfumes.

Perfumes may be classified as animal, vegetable, and artificial.

Animal Perfumes. The animal odors used in perfumery are ambergris, castor, civet, and musk. (Each of these except castor is described under its title; for castor, see BEAVER.) Animal odors are of great value because of their permanence and their penetrating power. Musk and civet, for instance, will impart their aroma to objects without coming in contact with them. Preparations of animal scents are used in the manufacture of various perfumes into which they enter in small proportions. Civet is extensively employed in sachet and other toilet powders. Musk constitutes the foundation of many perfumes. Tonquin musk, which is the highest grade, is the most expensive animal perfume. Castor has a fixing power equal to that of musk, and dilute tinctures of it are extensively used.

In concentrated form, all these perfumes are so strong as to be nauseating, and their preparation for the market requires skill and care. The original substances are soaked or macerated in alcohol to form tinctures; these are so strong that they can be used only in small quantities in the preparation of the perfumes.

Vegetable Perfumes. There are so many vegetable perfumes that it is impracticable to name them all. Odor-bearing plants contain little sacs or glands in which the odoriferous substance is stored, and the part of the plant used in its extraction is the part in which these glands are found in the largest numbers. The most delicate perfumes come from the blossom, as in case of the rose, the violet, and the heliotrope. The oils of these flowers are extracted by distillation, as in making the attar of roses, and by the use of fats for more delicate perfumes. Glass vessels are lined with fat, and the petals of the flowers are spread over its surface. The fat extracts the oil, and one supply of petals follows another until the fat becomes saturated. It is then placed in closed vessels with alcohol and heated. The alcohol dissolves the essential oil of the flower and rises to the top of the liquid, from which it is easily separated. A ton of petals yields from ten ounces to a pound of oil.

Some oils are found in the rind, as are those of the orange and the lemon. Those of the mints occur in the leaves and stems, and are obtained by distillation. The odor-bearing part of the cinnamon is the bark. Rosewood, cedar, and sandalwood bear their odors in the wood. Cloves and nutmeg bear them in the seed, and the sweet-smelling gums are obtained by bruising or cutting the trees. Whatever the method of extraction may be, the product reaches the manufacturer of perfumes in concentrated form. Great skill and long experience are necessary to the successful extraction of these perfumes, or the product obtained may have a scent entirely different from that desired. This is especially true of odors from flowers. Unless the blossoms are gathered at a certain stage of their development, the best effects cannot be obtained.

Artificial Perfumes. Within the last half-century, industrial chemistry has made possible the imitation of practically all vegetable and animal perfumes, so easily and so cheaply that their manufacture has become a great industry. With the exception of a few very expensive scents still made from flowers, all of the perfume now sold had its beginning in a chemical laboratory.

The imitation may contain the same chemical compounds which are in the natural perfume, or it may be a compound quite unrelated, but which has an identical odor. Heliotrope, lilac, and artificial musk were among the first successful synthetic perfumes. Coal-tar products yield almost all of the aromatic compounds.

The ease and cheapness of manufacture are astounding when one realizes, for example, that a pound of musk perfume costing $250 may be duplicated by an imitation which costs $4 per pound. With this advantage, and the fact that research constantly discovers new scents, there is reason to believe that the industry will continue to develop.

Manufacture and Use. The perfumes of commerce consist of various combinations of the animal, vegetable, and artificial perfumes, dissolved in alcohol and water. By varying the proportion, different perfumes are prepared from the same ingredients. Those of the best quality contain a larger proportion of animal perfumes than the less expensive preparations. Such perfumes as cologne and Florida water consist of water in which very small quantities of the odor-bearing essences have been dissolved.



Photo Visual Education Service; from an old painting

PERICLES ADDRESSING THE CITIZENS OF ATHENS

France is the leading country in the manufacture of perfumes. At Cannes, Nice, Nîmes, and Paris there are extensive manufactories. England leads in the production of lavender, and Turkey and Bulgaria are noted for attar of roses (see ATTAR).

Perfumes are used in commerce for imparting a pleasant odor to tooth pastes, cosmetics, soaps, and other preparations used in the home.

PERGAMUM, *pur' ga mum.* See PARCHMENT; PAPER.

PERIANDER. See SEVEN WISE MEN OF GREECE.

PERICARDITIS. See below.

PERICARDIUM, a cone-shaped sac of connective tissue which encloses the heart and a small portion of the large blood vessels at the base of that organ. The apex of the pericardium is behind the breastbone, and its base is attached to the upper surface of the diaphragm. It has a lining of smooth, serous membrane (see MEMBRANES), which entirely covers the heart; the inner surface of this lining secretes a lubricating fluid that serves to lessen the friction that would otherwise result from the movements of the heart. The outer layer of the pericardium consists of strong, interlacing fibers. When the sac becomes inflamed, it causes the disease known as *pericarditis.* See HEART (Diseases of the Heart). K.A.E.

PERICLES, *pehr' ih kleez* (? -429 B.C.), a Greek statesman who gave his name to the most glorious period of Attica, the greatest of Greek states. He was born at Athens, of a noble family, and was educated by the greatest philosophers of his day, but when he entered public life, he became the advocate of the rights of the common people. For thirty years he stood practically supreme in Athens, and the "Age of Pericles" became the symbol for all that was highest in the art and science of the ancient world.

The Reforms He Instituted. Pericles found Athens in the hands of the aristocracy, who alone could hold the higher offices; he made of it a complete democracy, in which every citizen was eligible to any office. This was accomplished in the face of serious opposition, at first from Cimon and later from Thucydides, but both these rivals were banished. One great obstacle to the success of Pericles was the Areopagus, the chief Athenian court, but he succeeded in divesting this of all its valuable political power.

Public officials in Athens before this time had been unpaid, but Pericles introduced salaries, first for the archons and later for all offices. He also provided that the state should pay the admission fees to the theater for all who could not afford to do it themselves, attendance on

the drama being a religious rite. As ardently as he hoped to make Athens a democracy, he hoped also to make it supreme in Greece, even dreaming of a league which should unite all the Greek states under the leadership of Athens.

Beautiful Athens. In pursuance of his designs, Aegina and Naupactus were reduced. Euboea was won back and Samos was subdued. The subject states poured money into the Athenian treasury, and with these funds, Pericles embellished the city. The temple of Athena Nike, the Propylaea, and greatest of all, the Parthenon, were but a few of the magnificent works which were produced under his guidance. Their erection gave employment to many men, and Athens enjoyed a period of unexampled prosperity. Literature and philosophy flourished, also, and had their part in making Athens the cultural center of Greece.



PERICLES
From a statue in the Vatican, Rome

Died at Height of Power. As to how large a part Pericles had in bringing on the Peloponnesian War there has been considerable discussion. The basal cause, however, was the jealousy of Sparta toward Athens, and the conflict could not well have been avoided. Pericles called into the city all the inhabitants of the surrounding district, which he allowed the Spartans and their allies to ravage as they pleased, while he made plans to retaliate by means of a navy. In 430 B C. the plague broke out in Athens, and the mortality was terrible. Blaming Pericles for their woes, the people deposed him, but he was soon recalled and became even more powerful than before. The plague, however, attacked him, and in 429 B.C. he died.

Related Subjects. For supplementary information, see ATHENS (The Ancient City), for the social aspects of his career, see ASPASIA. Read, also, PARTHENON, OSTRACISM.

PERIGEE, *pehr' ih je,* from two Greek words meaning *near* and *earth,* is applied in astronomy to that part of the moon's orbit which is nearest the earth. When at this point, the moon is said to be *in perigee.* The word at one time was used to designate the similar portions of the orbit of any heavenly body. The point opposite the perigee and farthest from the earth is called the *apogee.* See MOON; APSIDES. F.B.L.

PERIHELION, *pehr ih he' lih on.* See APSIDES.

PERILYMPH, *pehr' ih limf.* See EAR (The Internal Ear).

PERIODIC, *pe rih od' ik,* **LAW.** See CHEMISTRY (The Elements).

PERIOECI, *pehr ih e' si.* See SPARTA (Rise to Supremacy).

PERIOSTEUM, *pehr ih os' te um.* See MEMBRANES (Fibrous); BONE.

PERIPATETIC, *pehr ih pah tet' ik,* **SCHOOL OF PHILOSOPHY.** When the Greek philosopher Aristotle lectured to his followers, he was accustomed to walk about under the porticoes of the Lyceum at Athens. Both master and pupils walked about as they talked together, and because of this custom, or because they discoursed beneath a shaded walk, the philosophic school established by Aristotle came to be known as the *Peripatetic.* This term may be traced to the Greek word meaning *covered walk* or to the verb *to walk.* Aristotle's philosophy is the culmination of that developed under his predecessors, Socrates and Plato, and is based on the principle that all thinking must be founded upon the observation of facts. It was Aristotle's systematic mind that first divided philosophy into its departments of ethics, psychology, logic, etc., and he is known as the founder of these as separate sciences. The Peripatetic School was greatly aided in its researches by the gifts of Alexander the Great, who, when a lad, was tutored by Aristotle. See ARISTOTLE; PHILOSOPHY.



PRINCIPLE OF THE PERISCOPE
This crude device illustrates admirably the principle of the periscope. In actual use, it is highly perfected In the above diagram, two mirrors (*a a*) are placed in such positions that beams of light entering the open space at the top are reflected into the field glasses The periscope is not a new idea in mechanics; it applies the physical laws that light travels in a straight line and that the angle of incidence equals the angle of reflection. See SUBMARINE

PERISCOPE, the "eye" of a submarine. It is an optical instrument by which objects or ships which are on the surface of the water can be seen at a dis-

tance from the inside of a submerged submarine, and is constructed upon the same principles as the telescope (which see). In its simplest form, it consists of a vertical tube which is provided at each end with a reflecting mirror or prism. These reflecting surfaces are parallel and arranged at an angle of 45° with the axis of the tube. Between them there are several lenses. The tube, which can be moved in any direction by the observer, is within a strong stationary outer tube; the head of the latter is attached to the inside tube and moves together with it. When the periscope is above the surface of the water, the mirror at the upper end catches the reflection of objects in front of it. The images formed are then transmitted to the mirror at the lower end, and, as perfected for submarine warfare, the objects become visible by reflection upon a flat table below. The periscope is useful only during daytime when there is sunlight, but it enormously increases the fighting value of the submarine (which see). A.L.F.

PERISTALTIC, *pehr ih stal' tik,* **WAVES.** See STOMACH.

PERITONEUM, *pehr ih toh ne' um,* a thin membrane which lines the abdominal cavity, and covers its enclosed organs and those of the pelvis. The peritoneum is the most important of the serous membranes; its inner layer is arranged in folds which serve to keep the organs in position. Freedom of movement of these organs is made possible by a thin fluid which moistens the inside of the peritoneum Inflammation of this membrane is known as *peritonitis.* K A.E.

Related Subjects. The reader is referred to the following articles in these volumes

Abdomen	Peritonitis
Membranes	Spleen
Pelvis	

PERITONITIS, *pehr ih toh ni' tis,* inflammation of the serous membrane which lines the abdominal cavity (see PERITONEUM), is caused by some form of infection. Several forms are recognized. *Acute* peritonitis comes on suddenly and runs its course in about a week. *Chronic* peritonitis is long-continued and is usually of tubercular orgin. The *localized* variety affects a small part of the membrane, and the *general,* or *diffuse,* type involves a large area. Acute peritonitis is caused by bacterial infection resulting from rupture of the appendix or other organs, from intestinal ulcers and injuries to the alimentary tract, and various diseases affecting the organs of the abdominal cavity (see ABDOMEN). Its symptoms are mainly its sudden onset, chills, fever, rapid pulse, severe pain in the abdomen, difficult and painful breathing, vomiting, and intense thirst; the severity of the pain causes a characteristic pinched appearance of the features. A blood test will reveal an increase in the number of white blood corpuscles.

Cases of acute peritonitis demand prompt attention. When due to perforation of an organ, immediate operation is usually advisable, sometimes necessary, to save life. In non-perforative cases, the physician administers drugs to relieve pain and control vomiting, and gives saline purgatives. In localized cases, hot applications are often helpful in relieving pain. Rest in bed and a nutritious diet are important during convalescence. W.A.E.

PERIWINKLE. See MYRTLE.

PERJURY, the offense committed by a person who, having been sworn to tell the truth in a matter pending in a court of justice, wilfully and deliberately lies. To constitute perjury, a statement must not only be made under oath in a judicial proceeding, but must be material to, or have direct bearing on, the issue which is being tried. If, however, a witness makes a misstatement unintentionally, or a mistake is made, it is not considered perjury. *Subornation of perjury* consists in inciting or procuring another to commit perjury, and one found guilty of such act may be indicted and punished. Perjury generally is a *misdemeanor,* and is punishable as such, but has been made a *felony* in some jurisdictions. (Both of these terms are explained in these volumes under their titles.) The punishment for perjury may be both fine and jail sentence.

PERKIN, WILLIAM H. See ANILINE.

PERKINS INSTITUTION. See BLINDNESS (Education of the Blind); BRIDGMAN, LAURA.

PERMALLOY, *purm ah loi',* an alloy of about eighty per cent nickel and twenty per cent iron, which promises to revolutionize submarine-cable transmission. It is used to wrap the core of the cable, and automatically increases the magnetic effect of the current, which keeps the signals from jumbling, sharpens them, and thus improves the carrying capacity beyond anything previously known.

Experiments by the Western Union Telegraph Company seemed to demonstrate its value, and in the spring of 1924, the company risked a possible loss of $4,000,000 by laying 120 miles of the permalloy cable off the Bermuda Islands. Short-length tests showed a carrying capacity of 1,500 letters per minute. The question next was whether or not the permalloy would be equally effective on long distances and in the deepest parts of the Atlantic. In the fall of 1924, a new cable was laid from the Azores to New York City. Its value was proved when it transmitted 1,700 letters per minute. See CABLE, SUBMARINE. T.B.J.

PERMANENT COURT OF INTERNATIONAL JUSTICE, popularly referred to as the INTERNATIONAL COURT and the WORLD COURT. This Court is not, as many believe, a tribunal established as one of the agencies particularly designed to correct evils growing

out of the World War. Before that great catastrophe was anticipated, such a court was discussed by every first-class power in the world; indeed, while the United States did not give adherence to the Court until December, 1929, it was an American who took the initiative in presenting the subject to the nations. [The American nation cannot become fully a member until the Senate ratifies the President's declaration of adherence.]

It is well known that at The Hague there is a great Peace Palace, and that conferences on international peace have been held there at intervals since 1899. Impressed with the desirability of an international court of justice, Elihu Root, when Secretary of State in the Roosevelt administration, proposed such a body, and charged the American representatives to the second Hague Peace Conference to work for it. The idea was widely discussed, but was halted in 1914, when the World War began.

The Treaty of Versailles established the League of Nations; in that covenant, the Council of the League was directed to "formulate and submit to the members of the League for adoption plans for the establishment of a permanent court of international justice." In complying with this order, the Council was assisted by jurists of renown from twelve countries, including the United States, whose representative was John Bassett Moore. Participation in this preliminary and advisory work did not compromise any country in any degree. Plans were perfected by an international agreement in December, 1920. The judges were chosen in September, 1921, and the first regular session was opened at The Hague on June 15, 1922.

There are eleven members of the Court, and four deputy judges; they are elected by the Council and Assembly of the League of Nations, but in pursuance of their duties they are an independent body. The term of office is nine years, and members may be reëlected. Though the United States is not a member of the Court, John Bassett Moore, an American, was elected to one of the judgeships when the body was organized. He resigned in 1928, and Charles Evans Hughes was elected to the vacancy, resigning in 1930.

The Court cannot exercise compulsory jurisdiction, except in cases where nations by agreement have conferred upon it such powers. Any international question may be referred to the Court by agreement of the countries concerned, and the League of Nations may refer any question to it for a legal opinion. The nations which are members of the League are pledged under the League covenant to refer disputes with each other, or with an outside power, either to the Council or Assembly of the League, or to arbitration tribunals set up by agreement, or, finally, to the Permanent Court of International Justice. The Court must meet at least once each year, with a full bench. If a regular member is absent, a deputy member serves.

PERMIAN EPOCH, the final epoch of the Carboniferous Period, according to the usage of the United States Geological Survey. Many geologists, however, especially in other lands, rank the Permian as a separate period at the close of the Paleozoic Era. The name is taken from that of Perm, a province in Eastern Russia. The Permian series (or system) is extensively developed in all the continents and is of much geologic importance. The rocks are largely land or fresh-water sediments, but include some marine beds. They are chiefly sandstone, shale, and limestone. Gypsum deposits are abundant, and the great salt beds of Northern Germany are of Permian age.

The Permian was the time of transition from the geologic conditions that had prevailed during the latter part of the Paleozoic Era and those that prevailed in the early part of the Mesozoic Era. It was a time of widespread uplift in the continental conditions, and of mountain-building in some regions. The folding of the Appalachian and Ouachita mountains occurred largely at that time. There was extensive glaciation, as attested by glacial conglomerates or tillites in all the continents. In Brazil, India, and South Africa, there were great glaciers at low altitudes within the Torrid Zone. In Australia the tillites are interbedded with marine sediments and with coal beds, indicating an extraordinary alternation of conditions.

The geographic changes of the time seem to have had a disastrous effect on both plant and animal life, and the Permian rocks contain relatively few fossils. Several groups of invertebrates died out. There were, however, marine and fresh-water fish; amphibians reached a greater importance than at any time since, and primitive reptiles were remarkably developed. The plants show a progressive change from the forms of Pennsylvanian time toward those of the present, and the earliest known cone-bearing trees appeared. The ferns developed forms similar to those now common.

Several baffling geologic problems have arisen from the study of the Permian rocks. Glaciation at low levels seems to have been more widely distributed over the earth than at any other time, yet it was apparently confined to the Torrid and Temperate zones, and there are no indications of it in the Polar regions. The changes in plant and animal life were more marked than at any other time in the earth's history, and the reasons are not clear for the extinction of several previously flourishing groups of water-breathing invertebrates.

Pronounced climatic changes seem to have resulted from the great geographic changes, and, in turn, to have affected many other things on the earth's surface. L.LaF.

Related Subjects. The reader is referred in these volumes to the following articles:

Carboniferous Period	Mesozoic Era
Geology (Divisions of Time)	Paleozoic Era
	Triassic Period

PERNAMBUCO, *pur nam bu' ko*, or *pehr-nahm boo' ko*, BRAZIL. See BRAZIL (The Cities).

PEROXIDE, *pehr ok' side*, **OF HYDROGEN,** *hi' dro jen*. See HYDROGEN PEROXIDE.

PERPENDICULAR STYLE. See TUDOR STYLE.

PERPETUAL CALENDAR. See CALENDAR.

PERPETUAL MOTION, motion conceived as going on continuously in a machine operated by the energy it itself creates. The principle on which such a machine would be constructed is false, because energy cannot be created. By means of a water wheel and a dynamo, or electric generator, the energy in falling water may be transformed into electrical energy that will operate machinery or perform other work, but the electric motor cannot generate the current by which it is operated, nor can the steam engine produce the steam necessary to run it. What is true of these machines is true of all others; a moment spent in clear thinking should convince any sober-minded person of the fallacy underlying the perpetual-motion idea. Nevertheless, men have sunk fortunes and lost their minds in pursuit of this will-o'-the-wisp. See ENERGY. A.L F.

PERRAULT, *peh ro'*, CHARLES (1628-1703), a writer of fanciful fairy stories that have grown in popularity for two hundred years, and have been endlessly retold, changed, and colored to suit the taste of the countries which adopted them. He put into readable form *Little Red Riding-Hood*, *Sleeping Beauty*, *Bluebeard*, *Diamonds and Toads*, *Cinderella*, *Puss in Boots*, and many more of our best-loved fairy tales, and so brought them to the knowledge of the literary world. Perrault was born in Paris, and educated at the College de Beauvais. He studied for the law, but abandoned that profession after a year's practice, to devote himself to literature. His "Mother Goose" stories were published anonymously in book form in 1697, with a dedication signed by his son. Like the Brothers Grimm, of Germany, Perrault made use of the folklore tales that had been passed from generation to generation by word of mouth. An excellent adaptation of the stories, by Andrew Lang, is published under the title *Popular Tales*. See MOTHER GOOSE.

PERRY, BLISS (1860-), an American author, editor, and university professor. For over a score of years he has occupied the chair of English literature (belles-lettres) at Harvard University, a successor of Longfellow and of Lowell. He was born at Williamstown, Mass., the son of Arthur Latham Perry, an eminent political economist, and was graduated at Williams College in 1881, taking his master's degree there two years later. He also studied later at the universities of Berlin and Strassburg, and received honorary degrees from Princeton and other American institutions. Before he accepted the post at Harvard, in 1907, he was professor of English at Williams College (1886-1893) and at Princeton University (1893-1900), and for ten years following 1899, he edited the *Atlantic Monthly*. In 1909-1910 he represented Harvard at the University of Paris as special lecturer.

Literary Achievements. Professor Perry is widely known as general editor of the Cambridge editions of the poets, and as editor of the "Little Masterpieces." His writings include *Salem Kittredge, and Other Stories*; *The Powers at Play* (a novel); *A Study of Prose Fiction*; *Walt Whitman*; *Whittier*, *The American Mind*, *Thomas Carlyle: How to Know Him*; *The American Spirit in Literature*; *A Study of Poetry*, *Life and Letters of Henry Lee Higginson*; and *The Praise of Folly*.

PERRY, MATTHEW CALBRAITH (1794-1858), an American naval officer who opened the civilization of the world to medieval Japan, was born at Kingston, R. I. In 1809 Perry enlisted as midshipman on the *Revenge*, and the next year was transferred to the *President*, the ship which fired the first hostile shot in the War of 1812. In 1813 he was made lieutenant and accompanied his brother, Oliver Hazard Perry (which see), when the latter left the *Lawrence* for the *Niagara*, in the memorable Battle of Lake Erie.

Perry made a study of ship hygiene and formulated rules for discipline on his African station; these were in force for many years. He also wrote a treatise on the prevention of scurvy among sailors, and after studying the question of recruiting, founded the first naval-apprentice system. As commander of the *Concord*, in 1829, he took John Randolph, envoy to the czar, to Russia, the *Concord* being the first United States man-of-war to enter Russian waters. While there, Perry was offered a position of high rank in the Russian navy, which, however, he declined.

In 1837 he was advanced to the rank of captain. Later, he served on shore duty in the Brooklyn navy yard; there, under his superintendence, was built the first steam war vessel of the United States navy, the *Fulton II*, of which he had command from 1838 to 1840; in 1841 he received the rank of commodore. During the Mexican War, he had charge of the American fleet for a time.

In 1853 Perry organized and commanded the expedition to Japan, in its results one of the most notable enterprises in American history. Japan had lived for centuries in isolation, and

preferred to continue in medievalism, but by rare diplomacy Perry effected a treaty by which that country granted trade relations with the United States. Then followed in Japan the most rapid development any nation has ever known. See JAPAN (History: Foreign Intercourse).

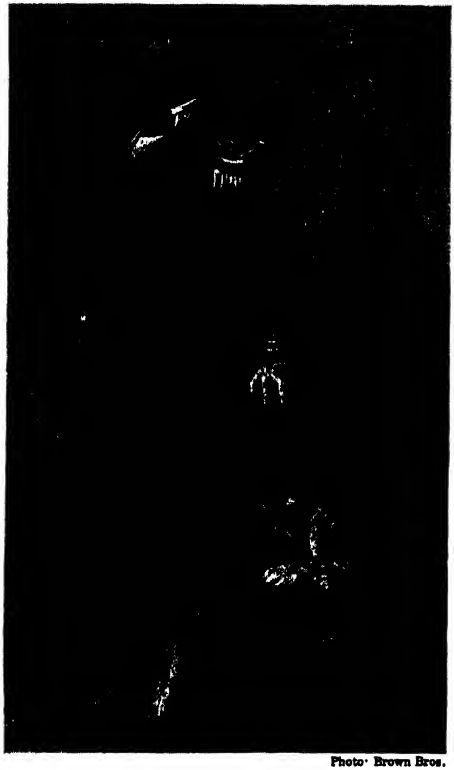


Photo: Brown Bros.

MATTHEW C. PERRY

The man who awoke a sleeping medieval giant which developed within fifty years to be one of the first five naval powers in the world.

PERRY, OLIVER HAZARD (1785-1819), an American naval officer, who, by his courage and intrepid leadership in the War of 1812, forced an entire British squadron to surrender. He was born in South Kingston, R. I., and was an elder brother of Matthew C. Perry (see above).

Oliver attended private schools, and was a pupil of Count Rochambeau, one of the notable Frenchmen who served in the American army during the Revolutionary War. In 1799 he went as midshipman to the West Indies. He also took part in the Tripolitan War (see BARBARY STATES). In 1807 the rank of lieutenant was given him. Like his father, he was interested in the building of war vessels, and was a fine tactician and disciplinarian.

Perry applied many times for a sea command, but, being unable to secure one, offered his services on the Great Lakes in the second war for American independence (see WAR OF 1812). Commander Chauncey sent him to Lake Erie, where by strenuous endeavor he collected a force of vessels—among them the *Lawrence* and *Niagara*—and left Put-in-Bay September 10, 1813, to meet the British. The battle began at eleven o'clock that day, with Perry on the *Lawrence*. The British guns had the advantage, and soon reduced that vessel to wreckage. Perry, with quick decision and dauntless courage, ordered his seamen to man a rowboat, and, taking his brother, hurried for the *Niagara*, which had fallen behind. Two British vessels became entangled, and taking advantage of this condition, the *Niagara* raked them with broadsides. By three o'clock the British fleet of six vessels had surrendered to a young man twenty-eight years of age. For the first time in history, England lost an entire squadron; the victor was advanced to the rank of captain. Perry sent to General William Henry Harrison, military commander in the West, the famous message, "We have met the enemy, and they are ours." The victory was not won, however, without heavy loss of life.

He took part also in the battles around Detroit and on the Thames in Canada (1813), and later commanded the frigate *Java* in the Mediterranean. While on this trip, he was stricken with yellow fever and died at Port of Spain, Trinidad, in 1819. In the rotunda of the Capitol at Washington is a painting showing Perry leaving the *Lawrence* for the *Niagara*.



Photo: Visual Education Service

PERSEUS WITH THE HEAD OF THE MEDUSA

[A statue by Canova; in the Vatican, Rome.]



Photo: Visual Education Service

COMMODORE PERRY AT THE BATTLE OF LAKE ERIE

[An illustration drawn from the painting referred to on the preceding page appears in a halftone engraving above]

PERSEPHONE, *pur sef' one*, the Greek name for Proserpina (which see).

PERSEPOLIS, *pur sep' o lis*. See PERSIA (The Cities).

PERSEUS, *per' se us*, or *pur' sus*, the son of Zeus and Danaë, in an old Grecian myth. When he was sent on a terrible journey to slay the Gorgon Medusa, the gods who had so carefully watched over him during the perils of his youth came again to his aid. Pluto lent him a helmet that made him invisible; Minerva lent him her magic shield which inspired terror in every beholder; and Mercury furnished him with winged sandals. Armed in this manner, Perseus flew to a land of perpetual darkness, the home of the Graeae, who alone knew where Medusa dwelt. The Graeae were three hideous sisters who had among them but one tooth and one eye, which they used in turn. Perseus, rendered invisible by his helmet, snatched the eye as it was passing among them, and refused to return it till they told him where Medusa lived.

Having gained this information, he flew on to Medusa's home, where he found her asleep. Remembering the strange power of her face, he held his mirroring shield before him, and, watching only the reflection of Medusa there, he cut off her head with one blow of his sword. Then, holding the head far above his sight, he flew hastily back, fearing the revenge of the sister Gorgons. From the drops of blood that trickled into the earth sprang the winged horse Pegasus, and from those that fell into the hot African sands a race of poisonous reptiles sprang. To the suffering Atlas, Perseus showed the head, and the giant became the mountain range. On his way, too, he rescued Andromeda, who had been chained to a rock

and left to perish, and he married her. The shield, helmet, and sandals he gratefully returned to the gods who had aided him, and the head of Medusa he presented to Minerva, who fixed it in the center of her terrible shield. Then Perseus, on his return to Thessaly, accidentally slew Acrisius, his grandfather. Later, he ruled wisely and well over Mycenae, and at his death the gods placed him and Andromeda, with her mother, Cassiopeia, as constellations in the heavens, where they may still be seen (see chart *The Heavens in Autumn and Winter*, under ASTRONOMY). A famous statue of Perseus with the head of Medusa, by Cellini, adorns the Loggia dei Lanzi, Florence. [For illustration of Perseus with Medusa's head, see page 5492.]

Related Subjects. The following articles in these volumes are of interest in this connection

Andromeda	Medusa
Atlas	Mercury
Gorgons	Minerva
Pegasus	

PERSHING, *pur' shing*, JOHN JOSEPH (1860-), commander of the American Expeditionary Forces in the World War. From his humble youth in an obscure town in Missouri, he advanced, step by step, to his nomination by President Wilson to the rank of full general, a grade held previously by only four Americans—Washington, Grant, Sherman, and Sheridan. The nomination was unanimously confirmed by the United States Senate in 1919. His dogged determination to see things through has been the saving grace in many crises faced in his picturesque and adventurous life.



Photo Fotograms

PERSHING STATUE IN SAN FRANCISCO

It is very seldom that a statue to a living person is erected anywhere in the world The California city ignored precedent, for tragedy bound it to the future general in a bond of lasting sympathy when the Presidio fire occurred

This son of a railway section boss determined early in life to secure a good education. He began to teach in a country school at the age of seventeen, and with the money he saved, was later able to enter the normal school at Kirksville, Mo. A chance announcement in a newspaper of a competitive examination for West Point Military Academy decided his career. He was successful in the examination, and graduated from West Point in 1886. Pershing began active service in the campaign against the Apaches, and later commanded the Indian scouts in the war against the Sioux. In 1891-1895 he was military instructor at the University of Nebraska, where he was able to embrace the opportunity to study law. He received his degree of LL.B. in 1893.

When the Spanish-American War broke out, Pershing was serving as instructor in tactics at West Point, but he immediately went into active service. He fought with the Tenth Cavalry during the Santiago campaign, holding then the rank of first lieutenant. After the occupation of the Philippines, he organized the Bureau of Insular Affairs, and was appointed its first chief.

During his stay in the Philippines (1899-1903), Pershing was made commander of military operations in Central Mindanao against the Moros, a savage tribe whom the Spaniards had never succeeded in conquering; and his excellent work won him the appointment of military governor of the islands. After the outbreak of the Russo-Japanese War, he became military attaché to the United States embassy at Tokyo, and accompanied General Kuroki's army to Manchuria. This appointment as military observer gave him an opportunity to study modern warfare on a large scale. On the conclusion of that conflict, he was transferred by the United States government to the Philippines, and in 1906 was promoted by President Roosevelt from captaincy to the rank of brigadier general. Appointed governor of the province of Moro, he was brilliantly successful as commander of the campaign against the rebellious Moros, completely defeating them at Bagsag (1913).

Pershing was subsequently stationed at San Francisco as commanding officer of the Eighth Brigade. While away in El Paso, Tex., he encountered the greatest tragedy in his life. In a fire at the Presidio in San Francisco, in 1915, his wife and three daughters were burned to death, his son, Warren, alone surviving. A true soldier, he bore his grief with great fortitude. In 1914, when relations between Mexico and the United States became strained, he was ordered to the border. The raid on Colum-

bus, N. M., by Francisco Villa's company of bandits, in the spring of 1916, brought matters to a crisis, and President Wilson then placed General Pershing in charge of the expeditionary forces in Mexico. After the death of General Funston, in 1917, Pershing was appointed his successor as commander on the Mexican border [see MEXICO (Government and History: Civil War)].

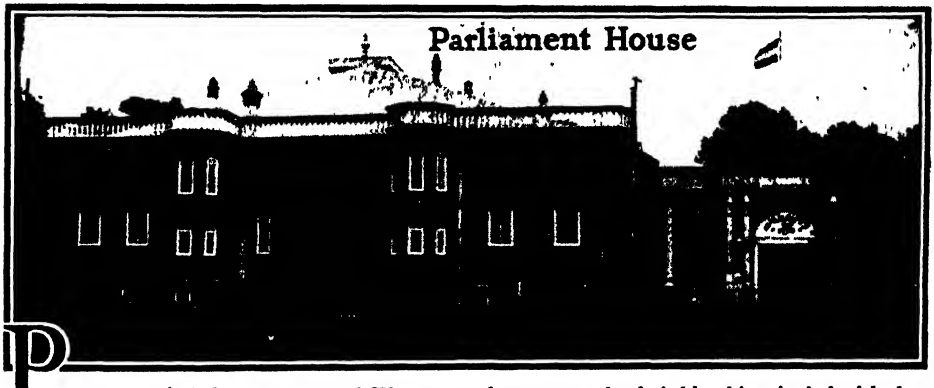


Photo U & U

JOHN J. PERSHING
The first military commander in charge of a United States army sent overseas

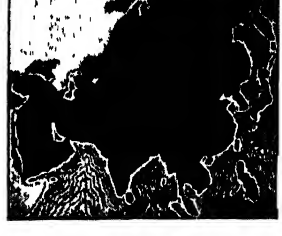
When the United States entered the World War, Pershing was placed in command of the American Expeditionary Forces by President Wilson. For the first time an American commander led American troops on European soil, and Pershing's reception upon his arrival in Paris was unprecedented, both in its character and in the enthusiasm it aroused in the eagerly awaiting French people. President Wilson appointed Pershing to the supreme command of the American armies in France, and to him fell the responsibility of shaping and training an army organization which, in eighteen months, expanded to almost 2,000,000 men. Marshal Foch of France, Marshal Haig of Great Britain, Marshal Diaz of Italy, and General Pershing constituted the Big Four of the allied armies [see WORLD WAR (The United States in the War)].

In 1921 Pershing was appointed chief of staff of the United States army. He was United States representative and ex-officio head of the commission to supervise the plebiscite under the Tacna-Arica Arbitration Award (see TACNA-ARICA AWARD) in 1925, but resigned because of ill health. He was retired in 1924 at the age of sixty-four. In 1929 he represented the United States at the funeral ceremonies of Marshal Foch in Paris, being then the sole survivor of the Big Four.



PERSIA, *pur' shah*, a country of Western Asia, with a history reaching back to memorable periods hundreds of years before the birth of Christ. To-day, however, "Persia's light has gone out," politically speaking, and the mightiest empire of ancient days is largely a stretch of rugged desert, with comparatively few people, railroads, or important cities. Lying between the Caspian Sea and the Persian Gulf, Persia occupies a great area of 628,000 square miles—two-thirds that of the United States east of the Mississippi River. The country appeals to the romantic instinct; it is a country from which beautiful things come, a land of jewels, fairy stories, and legends, and of rugs whose exquisite fabrics and patterns voice the life of ten million people.

The People. The original inhabitants of this "Land of the Lion and the Sun" were the ancient Iranians, the founders of the Aryan race. Though the Persians of to-day are of the same stock, their blood is mingled with that of the Mongol, Tartar, Arab, and Turkish settlers. The present population is of two classes, the dwellers in towns and the roaming herdsmen. The latter class includes 260,000 Arabs, 720,000 Turks, 675,000 Kurds and Leks, 20,700 gypsies, and 234,000 Lurs, many of them outlaws and brigands, serving their own particular chieftains.



LOCATION MAP
Showing the size of Persia in comparison with the entire continent of Asia.

The Persian men are strong and well built, and the women are generally small, with tiny

hands and feet. Both sexes like a profusion of cosmetics and jewelry, and the costumes of the rich are frequently embroidered with gold thread and rich jewels.

The Persian is more active in mind and body than the Turk, but is a true Oriental, ceremonious and impractical; a dreamer, not a man of action, and religious rather than moral. So religious is he, in fact, that he dedicates ten days of the Muharram, the first month of the solar year, to a period of deep mourning, in which he engages in street processions and passion plays to increase his religious fervor.

Ninety per cent of the natives are Mohammedans of the Shiite sect (see MOHAMMEDANISM), which has flourished in Persia because of the lack of frequent contact with the West. Practically the entire Shiah wing is made up of the Persian group. There are about 10,000 Parsees, 40,000 Jews, 50,000 Armenians, 30,000 Nestorians, and some Christians; many of the latter sects have been massacred by the Turks and Kurds, thus materially reducing their numbers.

Persia is the only one of the Tigris-Euphrates group of nations that for a long time has had a national system of education. Private tutors are employed by the richer class. There are national schools where children are taught the Koran, and colleges giving instruction in religion and in the Persian and Arabic languages. There are two military colleges, and normal and polytechnical schools at Teheran. United States and British missionaries are encouraging the education of women. A Ministry of Education is building up a system of primary and secondary education along European lines, and a broad general education is offered by native professors who have received their learning abroad. The American College of Teheran, with an enrollment of more than 800, is incorporated under the New York State Board of Regents and gives an accredited A.B. degree to its graduates.



Photo OROC

DRESS OF A MODERN LAD

A boy in the costume typical of those worn in Persia for centuries.

Literature. This has been almost the major contribution of Persia to the world. The *Gathas*, the earliest portion of the Zend-Avesta, or sacred book of Zoroaster, bear a close resemblance to the Sanskrit of the *Rig-Veda*. The great Persian epic, the *Shahnameh*, or "Story of the Kings," was composed by Firdausi to outline deeds of valor of Persian antiquity (940-1020).

A mystic in both religion and literature, the Persian has contributed a great part of the mystic poetry of the Orient. Jalaluddin Rumi (1207-1273) in his *Masnavi* and Sa'di in his *Odes* typify this form of verse.

Omar Khayyám, the exponent of Sufiism, has attained a popularity throughout the English-reading nations because of Fitzgerald's translation of his quatrains into English verse.

The Cities. The four principal cities of Persia which have present-day importance have a combined population of about 715,000. They are all described below:

Ispahan, *is pah hahn'*, or **Isfahan,** formerly the capital and now one of the large cities, is on the Zendehrud (river), over 200 miles south of Teheran, the present capital It is one of the oldest cities in Persia, and anciently was one of the most magnificent in Asia. During the reign of Shah Abbas, Ispahan was the capital city, and reached the height of its splendor and prosperity, attaining a population of about 1,000,000 It was then the market place of the world, having in its bazaars the riches and products of all the world, and in its courts, the princes and celebrities of Europe and the East. But in 1722 the Afghans invaded and devastated the city, and it never was able to retrieve its former position. The seat of government was moved to Teheran in 1788 by Agha Mohammed Khan Many ruined castles, mosques, and public monuments of this period stand to-day around the great "maidan," or public square, which was the first polo field in the world. Notable among the buildings is the celebrated Mesjid-i-Shah, or royal mosque, a magnificent example of Oriental architecture One of the most remarkable structures is the bridge of Allah Verdi Khan across the Zendehrud. It is over 1,000 feet long, rests on thirty-four arches, and is surmounted by arched galleries

The town is of commercial importance on account of its situation on the main route from Abushehr to Teheran, and it is active industrially, the chief manufactures being pottery, arms, gold and silver wares, and cotton and woolen goods. Its principal exports are tobacco, opium, rice, and rugs Population, estimated at 100,000.

Meshhed, or **Meshed,** *mesh' ed*, the capital of the province of Khorasan, is situated in the northern part of Persia The city is surrounded by a mud wall with towers, and entered through five gates. It is noted chiefly for its superb mosque, scarcely equaled in all Persia. This contains the sacred shrine of Imam Reza, a descendant of the founder of the Shiites, and is visited each year by 100,000 pilgrims of this sect. About 100 yards on each side of the

shrine and beyond its gates is a sanctuary where criminals may live in safety. Meshed is the center of several caravan routes which have declined in importance with the opening of the Russian railway from the Caspian Sea to Samarkand, however, the town is still of political significance, and Russia and Great Britain maintain consulates there. Meshhed manufactures and exports rugs, shawls, silks, porcelain, and sword blades, which are conspicuous for their high degree of excellence. Population, estimated at 85,000; possibly this is an underestimate

Tabriz, *tah breez'*, the most important commercial center of Northwestern Persia, the second largest city of the country, with a population of 180,000. It is the capital of the province of Azerbaijan, and is about thirty-five miles east of Lake Urumiah, at an elevation of 4,000 feet above sea level Its original importance and population have been greatly affected by numerous violent earthquakes. The inner portion of the city is unattractive, despite its well-stocked bazaars and many mosques, but the outlying quarters have beautiful gardens and orchards Before the Caspian Sea became the commercial highway of the territory, Tabriz was the trade center for Persia, India, and the Turkish and Russian dominions There is still a good trade in rugs, shawls, and dried fruits, most of which Russia buys The rugs are among the finest produced in Persia.

Tabriz has a military college, and is the headquarters of a branch of the Imperial Bank of Persia. It is connected with Julfa, on the Russian frontier, by a railroad opened in 1916. The Turkish language is most common in Tabriz, and other Turkish influences dominate. In 1914 the Russians and Turks captured the city.

Teheran, *teh h'rahn'*, the metropolis and capital city, is situated at the base of a snow-clad peak of the Elburz Mountains, about seventy miles south of the Caspian Sea and 210 miles north of Ispahan. Though it has developed as a typical Oriental city, with narrow streets and low, flat-roofed dwelling houses, Teheran is gradually acquiring modern improvements, with wide boulevards and architecture developed according to Western ideas. Boulevard des Ambassadeurs, on which are located many of the foreign legations, is one of the most attractive.

The city lies in a region made productive by water conducted from the mountains through underground canals, which also provide the inhabitants with their water supply. There is no government control of the supply, since some of the canals are privately owned, and in the summer there is often suffering for lack of water. Caravans bring their merchandise to this market, and the people carry on in a modest way the manufacture of cotton, linen, carpets, ironwork, hats, and shoes. There are tramways, electric lights, and telephones, and a local railway line extends from Teheran to a suburb. Harun-al-Rashid (which see), of *Arabian Nights* fame, was born in the vicinity of Teheran. In the summer, unpleasant climatic conditions drive the wealthier residents to the mountains The population is estimated at 350,000



Photo, Visual Education Service

A PERSIAN NOBLEMAN'S HOME

Among the ancient cities which have historical interest, but no present-day significance, are the following:

Persepolis, *pur-sep'o lis*, the ancient capital of the Persian Empire, was a royal metropolis whose splendor and magnificence were a source of wonder to the Greeks. Its site is marked by a series of ruins, including huge marble columns, vast portals, tombs, and sculptured figures. It lay in the fertile valley of the Medus River, about forty miles northeast of the modern city of Shiraz, and became the capital of Persia under Darius I. About 331 B C., the city surrendered to Alexander the Great, who sacked it and massacred the inhabitants By the sixteenth century, Persepolis had passed out of existence. About A.D. 200, another city, Istakhr, rose on its ruins, but this, too, has long been dead. The extensive ruins of Persepolis have been of great interest to archaeologists.

Susa, *soo' sah*, an ancient city, once the capital of the province of Susiana, or ancient Elam It occupied

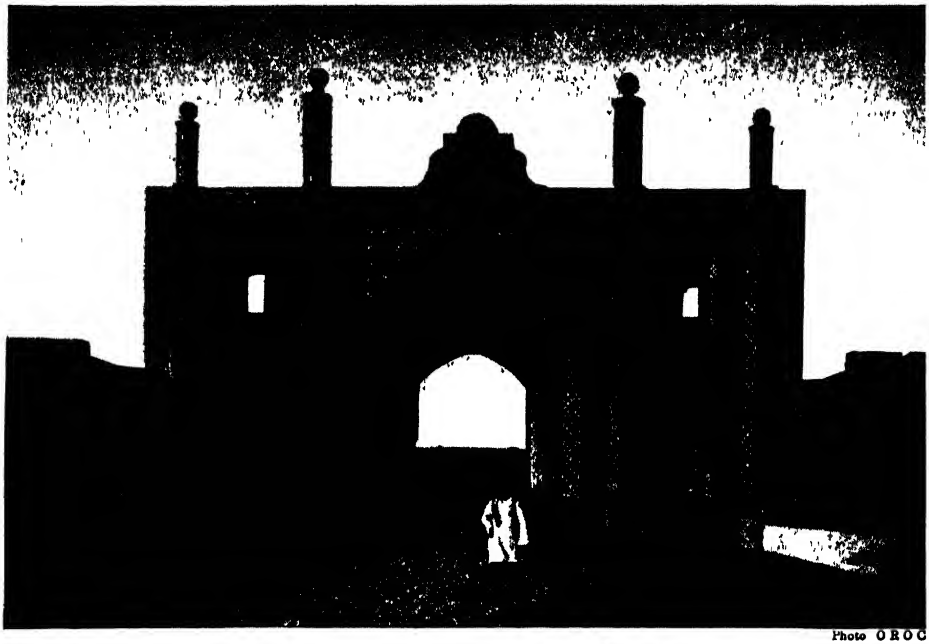


Photo OROC

ONE OF THE TWELVE GATES IN THE WALLS OF TEHERAN

a site on a plain in what is now the province of Khuzistan. During the reign of Cyrus, it was captured from the Babylonians, and when Darius II became king, in 521 B. C, he made it the ruling city over the whole Persian Empire. Several of the Persian kings built beautiful palaces, the remains of which form some of the most magnificent ruins of Asia The city is mentioned several times in the Bible in connection with Daniel and Esther, and in Scripture is usually spelled *Shushan*. From the time of Alexander, Susa gradually declined, until now the so-called tomb of Daniel, which is really a Mohammedan mausoleum, is the main landmark of the once famous city.

Industries. Persia is not an agricultural nation. Much of the arable land is not utilized, and the means of tillage are primitive, the same kind of plow, lumbering cart, and hand mill being used as in centuries past; but where the natives are industrious, cereals, peas, beans, sugar cane, and indigo are raised, and large quantities of fruits, gums, cotton, and Persian tobacco, which is of a superior quality, are exported. Persian melons are said to be the finest in the world. Opium is produced on a rather large scale, but almost the entire crop is consumed within the borders of Persia itself. In the northern provinces, along the Caspian Sea, rice-growing and tea-growing are the principal industries.

The natives not living in cities are chiefly a pastoral people, keeping large herds of goats and sheep famous for their fine wool; animal products constitute a large part of the country's wealth. Many fine Persian horses are raised, which are splendid for cavalry or ordinary purposes. The camels of Khorasan are noted for the distance they can travel in a day and the load they are able to bear.

There are no large factories in Persia; the manufacturing is done in private shops or schools where artistic silk and woolen tissues and the famous Kirman shawls of goat's hair are woven, and enameled metal filigree work is produced. Most important of the manufactured exports of Persia are the handmade Oriental carpets of thirty different kinds, each district of the country having its characteristic pattern. These rugs are made of a particularly fine variety of wool colored by native dyes, and are of the most perfect craftsmanship. The rug output is enormous; the old rugs, famous in the sixteenth century, are gone, but the looms in Tabriz, Hamadan, and Kirman are kept busy, and the export of Persian carpets is a very considerable item in the income of the country.

The manufacturing arts of Persia for some time have been declining, owing to neglect by the government, poor transportation, the advent of European products, and the indifference of the natives. Nearly sixty per cent of Persia's trade is carried on with the British Empire, seventeen per cent is with Russia, and most of the remainder is with the United States and Egypt. By a treaty in 1903, duties upon English and Russian imports were made uniform. Within recent years, the exports have been over fifteen per cent more than the imports.

Mineral Resources. The mountains of Persia contain great but undeveloped mineral wealth. The tin, iron, copper, lead, and coal of the northwest and central regions, and Kirman's borax, manganese, and marble are neglected to a great extent because of the difficulties and high cost of transportation. The turquoise mines of Nishapur have been worked from ancient times in a most primitive fashion, but with success. Rock-salt pits are abundant The total revenue to the government from mines is less than $100,000 per year.

Oil is produced near Ahwaz at the head of the Persian Gulf. An English corporation, of which the British government is a large shareholder, holds the oil concession, covering nearly 500,000 square miles. A city with paved streets and modern conveniences has grown up around the oil refineries at Abadan. Petroleum production in this field in 1927 was 39,688,000 barrels. Revenue to the Persian government from oil royalties in one year was $6,739,618.



Photo. O R O G

GLIMPSES OF PERSIAN LIFE

Weaving mats from reeds As this work must be done on the floor, it becomes a tiresome task In the background is a traveling barber at work

Transportation and Communication. Most of the trade routes of Persia are narrow camel paths crossing the rough mountainous country into Russia, Afghanistan, and India. A highway for wheeled traffic, extending 217 miles from Resht, on the Caspian Sea, to Teheran, was built in 1899 by Russia, and another, ninety-one miles long, between Ispahan and Ahwaz, was constructed by the British in 1900. Since the World War, during which Persia was overrun by German, Turkish, Russian, and British soldiers, passable motor roads have been constructed all through the country. In 1925 an American road-construction engineer was employed by the Persian government to supervise construction and maintenance.

Persia's railroads are few, and include six miles between Teheran and one of its suburbs, eighty-five miles from Tabriz to Julfa, and a short road of six miles between Resht and Pir-i Bazaar. A railroad to connect the Caspian Sea and the Persian Gulf has long been contemplated. In the spring of 1928, concessions were granted several German and American companies to start actual construction of this line, which will open up the resources of the entire nation. It will be 900 miles in length, and cost about $100,000,000. The annual revenue of about $7,000,000 from the sugar and tea monopoly was set aside for the project. Since 1925, regular air service has been maintained throughout Persia by the German Junkers air corporation. Teheran is the center for this mail and passenger service. Connections are made with the Imperial Airways at Baghdad and the Russian Airways at Baku.



Photo. Visual Education Service

GUARD HOUSE

Built as a shelter for those who watch the crops, to protect them from bandits. During the harvest peasants sleep there, that the vigil may not be relaxed.

Merchandise is carried by steamship to Russian ports across the Caspian, and to English and Indian ports by way of the Persian Gulf. A telegraph system of about 13,600 miles of wire carries nearly a million telegrams each year. Persia maintains 5,000 miles of wire, and the rest of the mileage is operated by the British government. Since 1904, Persia has had telegraphic communication with India. The mail is carried regularly to and from about 800 postoffices, and there is service twice weekly to and from Europe. Wireless

has been installed at Teheran, and most of the principal cities have local telephone service; long-distance connections are gradually being established.

Physical Geography and Climate. The greater part of the country is an elevated tableland 3,000 to 5,000 feet high, broken by rough hills and enclosed on all sides but the east by a wall of bleak mountains—the Zagros on the west, the Kurdistan Mountains on the southwest, and near the northwestern boundary the Elburz range, whose highest peak, Demavend, rises to 18,500 feet. The plains of the table-land are barren, and the surrounding slopes have only a scanty covering of dwarf oak, cypress, and walnut trees, but the valleys are made fertile by the melting mountain snows, and here is found a great variety of timber and plants; most of the crops of Central Europe can be raised.



Photo Visual Education Service

PEASANT WOMEN BAKING BREAD IN MUD OVENS

Dense, humid, malarial forests border the shores of the Caspian Sea, while along the Persian Gulf, the table-land drops to a sandy plain, spotted with only a few patches of green oasis. In the eastern part of the country, divided by a narrow ridge of hills and a caravan route, lie Persia's two desert areas—the Great Salt Desert, a sea of rock salt covering 600 square miles, and the Great Sand Desert.

In the central highlands there are a few streams flowing into inland lakes or losing themselves in the sand. The only rivers of any size are the Safid Rud, near the Persian Gulf, and the Karun, emptying into the Caspian Sea; these are navigable by light steamers only. Besides a number of small fresh-water lakes, Persia has three large but shallow salt lakes —Siestan, east of the Great Salt Desert, Urumiah in the northwest, and Niriz in the south

In summer one experiences many changes of temperature in traveling from the cold mountain peaks through the clear, dry heat of the table-lands to the sheltered, warm valleys below. The shores of the Caspian are tropically hot and humid, and along the Persian Gulf it is so hot and dry that even the scorching gulf winds give relief. In this region, the heat lasts throughout the year, but the eastern plains are bleak during the winter months.

History and Government

Persia, next to Egypt and China, is the oldest country in the world. Of the early history we have only legend, and the Greek writers supplied the first written accounts, which show many contradictions. The northern part of the Iranian plateau was occupied by the Medes, who in 633 B.C. conquered the Persians and Assyrians. At the end of that century, however, Cyrus the Great of Persia conquered Media and founded a mighty empire extending from the Oxus and Indus rivers to the Mediterranean. His son, Cambyses II, the Tyrant, added Tyre, Cyprus, and Egypt to the empire, but Darius I, in an attempt to extend the empire over Greece, was defeated in one of the world's decisive battles at Marathon, in 490 B.C. This Grecian victory made it certain that the chief influence in civilizing Persia would be Western rather than Oriental.

Darius originated the Eastern system of satrap government, dividing the country into provinces, over each of which was placed a *satrap*, or governor, responsible to the king. Xerxes I, called by the Hebrews Ahasuerus, with an army and fleet surpassing any that had previously existed, was defeated by the Greeks at Salamis in 480 B.C. and at Mycale and Plataea in 479; these defeats shattered Persia's hope of supremacy in Greece and in Europe. The expense of this great army exhausted the empire, and Persia's decadence began.

In 330 B.C., Alexander the Great conquered Persia, and it remained under Grecian rule for a century. The kingdom then passed successively into the hands of the Saracens and the Turks, and in 1251 it was conquered by the Mongols under Genghis Khan. A century later, it was freed by the Persian leader Timur (which see), only to be divided among his sons and invaded by the Turkomans, after his death. By the sixteenth century, Shah Abbas

had reunited the kingdom, and prosperity continued for a hundred years, when civil war again broke out.

In 1795 unity was restored by Agha Mohammed, of the Kadjar race, who added Georgia and Khorasan and founded the present dynasty. Later, coming into conflict with Russia on the Caucasian frontier and the Caspian Sea, Persia lost several districts along the Kur, and Georgia in 1801. In 1813 Daghestan, Shirvan, and Bakin and the right of navigation on the Caspian Sea were ceded to Russia. In 1826 Russia was given Persian Armenia and an indemnity of $6,000,000. To pay this sum required heavy taxation, which led to an insurrection in 1829, when almost all of the Russian legation was murdered by a Persian mob. As a penalty, Russia exacted more concessions.

Internal dissatisfaction continued, and in 1834, assisted by Great Britain and Russia, Mohammed Shah obtained the crown, but he and his son, Nasr-ed-Din, came into conflict with England for encroaching upon Afghan territory; they were forced to sign a treaty in 1853, promising not to interfere in Herat, a commercial center of Afghanistan. In 1870 Russia recognized Persia's jurisdiction over Atrek. Nasr-ed-Din was assassinated in 1896 and his son succeeded him. In 1906 parliamentary government was established, and in 1907 the throne was given to Ali Mirza.

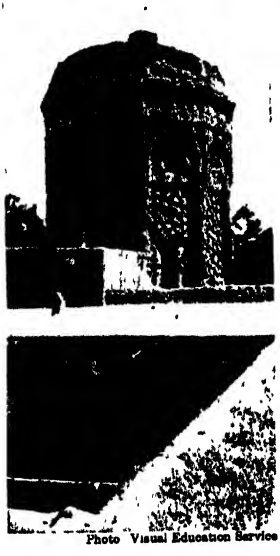


Photo Visual Education Service

MONGOL TOWER
A relic of twelfth-century Persia.

The Constitution adopted in 1906 provided that the shah, formerly an absolute monarch, should be assisted by a Ministry headed by a Premier. The finances were to be administered by a Parliament (*Majlis*), to prevent the country from being controlled by foreign nations that might bribe the shah and cater to his extravagant habits to gain economic advantages. This measure was unpopular with the shah and his party, and riots and disturbances were prevalent. In 1909 the shah forced the Cabinet to resign, and the Prime Minister was exiled. The Nationalists were victorious in the civil war that resulted, and the shah was deposed. His son, Ahmed Mirza, a boy of eleven, was proclaimed ruler, and the country was administered by a regency until 1914, when the shah became of legal age.

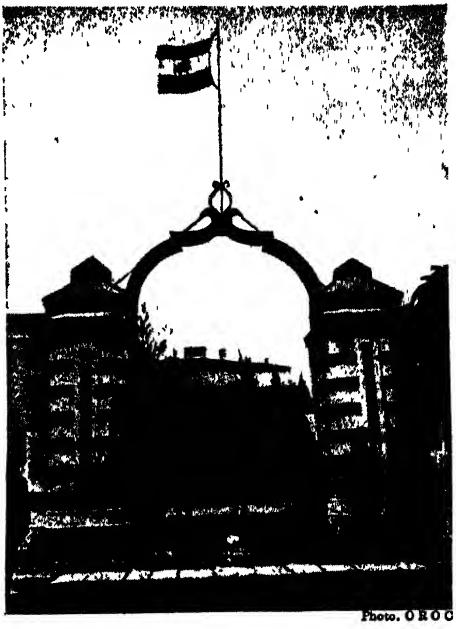


Photo. O R O C

ENTRANCE TO THE SHAH'S FAVORITE PALACE
Built by the present ruler while he was Minister of War under the Kajar dynasty

After the beginning of the twentieth century, Persia became a fighting ground between two great powers of Europe, with a third viewing the situation with envious eyes. Its geographical position rendered it necessary to Russia, Britain, and Germany, in their far-flung schemes of empire. By a Russian-English treaty in 1907, which was a diplomatic step to bring about a *triple entente* with France to check the power of Germany, the country was divided into three spheres of influence. The Russian extended over 305,000 square miles along the Russian frontier; the British covered 137,000 square miles on the western frontier; the remainder formed the neutral sphere, which Germany looked upon with envious eyes. England and Russia agreed to respect the integrity of Persia and to aid in the administration of finances.

Problems arising from the collection of taxes, as well as methods of levying and disposal of the funds collected, brought about the appointment of W. Morgan Shuster, an American recommended by President Taft, as treasurer-general, with full financial control. He was given almost unlimited power in the hope

that he would straighten out the finances of the country; but his activities met with the disapproval of Great Britain and Russia, not to mention the hostility of the politicians and wealthy Persians who had always escaped taxation. Mr. Shuster had the support of Parliament, but Russia issued an ultimatum November 29, 1911, demanding that he be dismissed and that Russia and Great Britain be allowed to appoint the new treasurer-general. Parliament tried to resist the demand, but Russian troops landed in Persia, and forced the government to acquiesce. Great Britain and Russia continued in their spheres of influence until the World War, when the Bolshevistic revolution in Russia and the final defeat of the Central Powers left the country largely under the influence of the British interests.



Photo OROC

THE CROWN PRINCE OF PERSIA

The little fellow is watched over by five stalwart cousins The future king bears the name Mohammed Reza Pahlevi, the latter name being that of the new dynasty

Left without a rival in this rich country of undeveloped resources and strategic geographic position, Great Britain threatened even the small amount of independence enjoyed by Persia. Realizing this danger, Persian leaders attempted to appeal to the Peace Conference, but there, too, British influence prevented their presenting their complaints. Increasing ill feeling toward Great Britain compelled the British to evacuate Kazvin in 1921, and in the fall of the same year, the British controller of finances left the capital, and the last of British interference in internal affairs was removed.

Free once more to select its own advisers, Persia again sought an American specialist in finance, and an American expert in sanitation. Dr. Arthur C. Millspaugh, an American economist, was secured to direct the finances, and his success won for him cordial coöperation and strengthened the good will toward the United States which was developing as antagonism toward Great Britain increased. Dr. Millspaugh was able to convert a heavy deficit into a small surplus, but at the end of his contract in 1927, he refused to accept a new one which curtailed his powers. Parliament authorized a Persian National Bank in 1927, with a capital of $15,000,000, financed by proceeds from the sale of the crown jewels and public domain.

In the fall of 1927, Russia and Persia signed a pact of neutrality and non-aggression which provided that neither should send armed forces into the territory of the other, and that each should remain neutral should the other be attacked by a third power. The Caspian Sea fisheries were placed under a twenty-five-year agreement, to be enjoyed jointly by the two countries through a company headed by a Persian. The settlement caused the embargo on Persian goods at Russian frontiers to be lifted, and it is expected to result in great impetus to commerce.

In 1924 there were developments which threatened the existence of the dynasty. The shah had become attracted to European society, and spent much time in gay revels in Paris. In 1925 the young monarch was deposed, and in his stead Reza Khan, a man of strong will who rose from the ranks in the army to be commander in chief, was chosen shah by the National Assembly. He is assisted by a Premier and eight Ministers of state, and his powers are restricted by the Parliament of 120 members and the laws of the Mohammedan religion. In 1927 the Ministry of Justice was reorganized under a Persian trained in jurisprudence in Europe. He is attempting to establish a civil and criminal code which will replace the Moslem laws in civil and criminal matters. In the spring of 1929, native costumes of the men were abandoned in favor of trousers of European design. Fine and imprisonment threatened those in the towns and cities who resisted the innovation, while the peasants were allowed a year to make the change. H.B.Y.



Photos U & U

REZA KHAN

The ruler of Persia, whose strength drove the reigning family (the Kajar dynasty) from Persia. He established a new dynasty.

Related Subjects. The reader who is interested in Persia is referred in these volumes to the following articles

HISTORY

Alexander the Great	Marathon
Cyrus (the Great)	Media
Darius (I)	World War
Greece (History)	Xerxes

LEADING PRODUCTS

Carpets and Rugs	Opium

PHYSICAL FEATURES

Caspian Sea	Persian Gulf
Elburz	

UNCLASSIFIED

Hafiz	Mohammedanism
Iran	Omar Khayyám
Khan	Rubaiyat

PERSIAN GULF, an arm of the Indian Ocean separating Persia from Arabia, and connected with the Gulf of Oman by the Strait of Ormuz (see political map under ASIA). Including its islands, the Persian Gulf has an area of about 90,000 square miles; its greatest length is 520 miles, and its average breadth 180 miles. The Euphrates and Tigris rivers, which unite for the last 120 miles of their course to form the stream called Shat el Arab, pour their waters into the gulf. The principal ports are Bandar Abbas, Bushire, and Lingah, in Persia; Koweit, in the sultanate of the same name, Arabia; and Manama, chief trade center of the Bahrein Islands. The Karun River, at the head of the gulf, has been opened to navigation as far as Ahwaz, Persia. The principal islands in the gulf are the Bahrein group, noted for their pearl fisheries, Ormuz, and Kishm. Bahrein pearls were sold in Egypt many centuries before Christ, and they still furnish eighty per cent of the world's supply. Iron, coal, salt, and lead have also been found on the islands.

PERSIAN MELON. See CASSABA.

PERSIAN WARS. See GREECE (The Period of Glory).

PERSIMMON, *pur sim' un*, one of a group of fruit-bearing trees belonging to the ebony family. Two species are found in temperate North America. The *common persimmon* is distributed from Rhode Island to Florida and west to Kansas and Texas. It is an attractive tree of graceful appearance, not usually growing higher than fifty feet, and bears shiny green leaves, small, yellowish-green flowers, and a deep-yellow fruit an inch or more in diameter. This fruit is so bitter before it is ripe that a bite into one fairly "puckers" the mouth. Persimmons taste best after the frost has touched them. It is the tannin in them that makes them so astringent before they have ripened. The wood of the tree is very hard, tough, and fine-grained, and is used in turnery. Persimmon trees are propagated by budding and grafting. They are difficult to transplant.

The other species, the *black persimmon*, grows in the western part of Texas as far south as the Gulf of Mexico. Its fruit is black and insipid, and is valued chiefly for a black dye obtained from the juice. The wood, too, is black, sometimes with yellow markings, and is used to a limited extent for engravers' blocks. The woods of both species are inferior to the ebonies of their tropical cousins.



Photo Visual Education Service

PERSIMMONS

The Japanese and Chinese cultivate varieties of persimmon that bear fruit larger than and much superior to the American. The Japanese persimmon, known as *kaki*, which has been introduced into the Southern states by the Department of Agriculture, has been grafted upon the native tree with excellent results. In Japan persimmons are dried for the market. A dried persimmon, both in appearance and in flavor, is much like a dried fig. B.M.D.

Scientific Names. Persimmons belong to the family *Ebenaceae* The common persimmon is *Diospyros virginiana*; the black is *D texana*. The kaki is *D kaki*.

PERSISTENCE OF VISION. See MOVING PICTURES.

PERSON, *pur' s'n*. The power a noun or a pronoun has to indicate, by either form or use, whether it refers to the speaker, the person spoken to, or the person or thing spoken of, is called its *person*. If the word denotes the person speaking, it is said to be in the *first person*; if the person addressed, it is in the *second person*; if the person or object spoken about, it is in the *third person*.

Person in Pronouns. It is only the personal pronouns that make such distinction of grammatical person through a change in form, and it is this fact that accounts for their name. *I, we, myself* are pronouns of the first person; *thou, you, yourself* are of the second person; *he, she, it, they, himself, themselves*, and the like, are pronouns of the third person. See PRONOUN.

Person in Nouns. While a noun does not change in form to denote person, it can denote the same three grammatical persons as the pronoun; we learn its person from the way in which it is used and from the context.

First Person: I, *John Hamilton*, do hereby appoint and declare, etc. (in apposition with first personal pronoun).

Second Person: I call upon you, *John Hamilton*, to produce the proofs (noun in apposition with a second personal pronoun).

Third Person: That is *my dog*. This is the most commonly used person, for every noun

which is neither in apposition with a pronoun of the first or second person, nor used in direct address, classifies as a third-person noun, even though it may directly refer to a word denoting first or second person. In the following examples, the italicized words are all of the third person: You are my *prisoner*; I understand, your *Highness*; I am *monarch* of all I survey.

Person in Verbs. Except in the case of the verb *to be*, it is only in the third person singular of the present tense that the person of the subject affects the form of the verb. That is, we say *I call* and *you call*, but *he calls*, *he leads*, or *he goes*, adding *s* or *es*.

Thus we see that it is only in the case of pronouns and verbs that person is of genuine importance so far as the actual form of the word is concerned. It is only for convenience in grammatical analysis that person is said to belong to nouns, since they are invariable in form, whether denoting the speaker, the person addressed, or the object or person concerning whom a statement is made.

PERSONAL LIBERTY. The right of an individual to life, liberty, and the pursuit of happiness is a foundation principle of every enlightened government. However, the right is subject to much abridgment, and the more complex society becomes. the greater must be the limitations upon the liberties each person may enjoy. In a comparative wilderness, a man may do practically whatever he wishes to do; it may be that no other people exist whose rights may be infringed upon by anything he may do. In a densely populated section, restrictions by the hundred may be necessary to assure freedom and justice to all. As a matter of fact, the personal liberty of an individual extends only to the point where his actions infringe upon the rights of other people. When a man says, "I shall do what I please to do," he will do well to avoid entering the circle of another man's rights or of another's personal liberty.

You may walk across the vacant property of your neighbor until he asks you not to do so; thereafter you are a trespasser. You may not always do what you please with your own property; for example, to burn an old building on your land may be the easiest means of ridding yourself of it, but if the flames would endanger the property of another—even a tree on his land—you must not set the building on fire. A railroad man, pleading his personal liberty, may declare his right to drink liquor; his employers deny him that right, because patrons of their train service have a right to clear-brained, intelligent service.

When personal liberty passes the point where it has due regard for the rights of others, it becomes *license*. It was this fact that caused Madame Roland to exclaim:

O liberty! liberty! how many crimes are committed in thy name!

PERSONAL PROPERTY. All property is divided into two general classes, *real* property and *personal* property. Real property embraces lands, including houses, trees, and all other immovable objects thereon; personal property includes all other property. Livestock, farm implements, and crops that have been harvested are good examples of personal property; money, a merchant's goods, and promissory notes are other examples. Real property cannot be transferred except by written contracts (see DEED), but personal property can be transferred by verbal contract. Buying a pair of shoes and paying money for them is a good example of transfer of personal property. In most states, real property descends to the heirs on the death of the owner, but the personal property passes into the hands of the administrator of the estate, who sells it and divides the proceeds among next of kin, unless provision is made for its disposal by will. See CONTRACT, REAL ESTATE; MORTGAGE (Chattel Mortgages).

PERSONIFICATION, *pur sahn ih fi ka' shun*, a figure in rhetoric in which life is attributed to inanimate objects or to abstract notions. The Psalmist, in *Psalm* XIX, 1, used personification when he wrote, "The *heavens declare* the glory of God." In Thomas Gray's *Elegy* there are two examples of personification in the lines—

> Fair *Science frowned* not on his humble birth,
> And *Melancholy marked* him for her own.

Personification cannot always be distinguished from metaphor, which is founded on the resemblance of one thing to another. Such an expression as *the raging sea*, for example, could be considered as either metaphor or personification, for the sea is likened to a wild beast (implied comparison) and it is also endowed with life and action. See FIGURE OF SPEECH; METAPHOR.

PERSPECTIVE, *pur spek' tiv*, the art of representing objects upon a plane surface, not as they are, but as they appear in space to the eye. The science of perspective is based upon certain fundamental facts. One of these is the apparent decrease in the size of an object as the distance between it and the observer increases. For example, a ship seems to grow smaller and smaller as it sails away from harbor, and the apparent decrease in size continues until the vessel is lost to sight. Another basic fact is the apparent gradual decrease in size of objects of like dimension which stand at different distances from the observer. This is illustrated by Fig. 1, which shows a line of telegraph poles. To an observer, the first pole in a row seems the largest, and each of the others appears to be slightly smaller than the one ahead of it. Again, two parallel lines of poles

or the two parallel rails of a railway track appear to converge as they recede from the eye, and finally to meet at the *vanishing point.*



FIG. 1

The appearance of objects is also affected by the position of the observer; that is, according to whether the objects are on a level with the eye, or are above or below it.

The rules for perspective can be easily understood by studying a cube, book, or other similar object (see Fig. 2). All of the lines

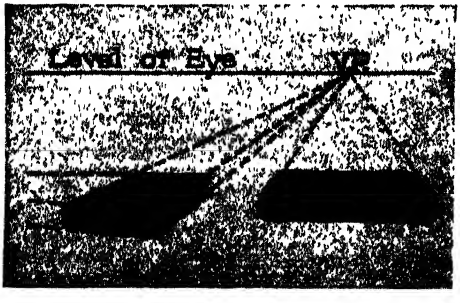


FIG 2

(forming the edges) which have the same direction belong to a group, or *system*; each line is an *element* of the system. Each system has its own vanishing point, and all the lines of a system seem to converge toward the vanishing point of the system. Any system which vanishes upward will have the vanishing point above the observer's eye, a system which vanishes downward will have the point below the eye; the vanishing point of a system of horizontal lines will be on a level with the eye, and that of a system of vertical lines will be vertically in line with the eye. There are similar rules for systems vanishing to the left and to the right. All horizontal lines have their vanishing points in the horizon, as is illustrated by Fig. 1.

PERSPIRATION, *pur spi ra' shun,* a colorless liquid secreted by glands in the skin (see GLANDS). Over ninety-nine per cent of it is water, but it contains also small quantities of urea, sodium chloride, and other salts. Distributed over the body are about two and one-half million sweat glands, which, day and night, are discharging their contents upon the surface of the skin. From this statement it is easy to see that the skin is a very important organ for the elimination of certain waste products from the body, and also important for its assistance in the regulation of body temperature. That portion of the fluid which evaporates as fast as it is secreted is known as *insensible* perspiration; *sensible* perspiration is that which accumulates in drops on the surface of the skin.

It is interesting to know that the dog has sweat glands only in the soles of his feet. The moisture that we eliminate in perspiration he takes care of in his "panting."

The amount of perspiration discharged varies in healthy persons from twenty-five to seventy-one ounces a day, but exercise and a high temperature cause an increase in the amount secreted. In warm weather, the evaporation of large quantities of perspiration helps keep the body cool. In health, the flow of perspiration and rate of evaporation are maintained in that proportion needed to keep the temperature of the body at the normal point of 98° F. When one has a fever, the skin is dry because the sweat glands are inactive. Profuse perspiration is sometimes brought about in treating kidney trouble, so that the sweat glands may help rid the body of excess fluids, caused by failure of the kidneys to work properly. Evaporating sweat leaves a film on the skin, and the entire body should be bathed frequently to keep the pores open. See SKIN; BATHS AND BATHING. K.A.E.

PERTH, AUSTRALIA. See WESTERN AUSTRALIA.

PERTH AMBOY, N. J., a city and port of entry in Middlesex County, fifteen miles southwest of Newark, is situated on a fine harbor on Raritan Bay at the mouth of the Raritan River. From its extensive plants for the smelting and refining of copper and silver comes much of the silver used in United States coinage. Population, 1928, 50,100 (Federal estimate).

Among the city's interesting features are City Hall Park, a public market, and a statue of George Washington. Its historic buildings include Franklin Palace, the home of William Franklin, last royal governor of New Jersey; Bartow House, where William Dunlap, art historian, made his first drawings; and Parker Castle, the center of Loyalist influence at the time of the Revolutionary War.

Transportation. Perth Amboy is served by the Lehigh Valley, the Pennsylvania, the Central of New Jersey, and the Staten Island Rapid Transit railways, and a new "Outerbridge Crossing." Motor-

bus and interurban lines extend to neighboring cities and to the beach resorts of the coast.

Industries. The water front on Raritan Bay, with its shipyards and dry docks, makes possible an extensive commerce, especially in coal. Trade in Perth Amboy has been facilitated by the location here of the terminal coal docks of the Lehigh Valley Railroad. The terra cotta and bricks manufactured on a large scale come from the vast deposits of fire clay in the vicinity. Other leading products of manufacture include wire and cable, asphalt paving and roofing, cigars, chemicals, ice cream, and vaseline.

History. Settled in 1683, Perth Amboy was the capital of New Jersey province until the Revolutionary War, when its last royal governor, William Franklin, was captured here in 1776. The city was first called Amboy, after the original Indian name. In 1684 it was named Perth, in honor of James, Earl of Perth; a few years later, the two names were combined. The place was incorporated as a city in 1718, and received a charter in 1784. A second charter was granted in 1844, which was revised in 1870. In colonial days, the city was the chief port of entry for negro cargoes from West Africa. A.B.

PERTHITE, a minor gem, named for Perth, Ont., where it was found. It is a mixture of orthoclase and albite.

PERTINAX, *pur' tih naks*, a Roman emperor. See SEVERUS, LUCIUS SEPTIMIUS.

PERTURBATIONS, *pur tur ba' shunz*, a term used in astronomy to describe certain variations in the motions of heavenly bodies. The planets move in well-defined, slightly elliptical orbits around the sun, influenced chiefly by the gravitational force of that body. But, in addition to the sun's attraction, the planets are affected by the attraction of other planets or of their satellites, and this added force causes variations in the planetary orbits. It was such an oscillation, or perturbation, of the orbit of Uranus that led to the discovery of the planet Neptune, for the irregularity in motion of Uranus was accounted for on the supposition that another unknown planet was exerting a force sufficient to disturb the calculated path of the known planet (see NEPTUNE). The moon's attractive force causes perturbations in the earth's motion. See GRAVITATION. F.B.L.



PERU, a republic facing the Pacific Ocean for about a thousand miles, in the northwestern part of South America, is a land of romantic history, sublime scenery, and of growing economic importance. The Spaniards who visited the Panama country in 1515 found a chief named Biru. This name was changed to the form *Peru*, and was used to designate all the land in the south which was unknown to the explorers, but about which they had heard remarkable stories concerning riches and gold. The width of the Peruvian republic is about 700 miles; the area is about 521,513 square miles, exclusive of Tacna, which has 9,248 square miles, and which was awarded Peru in 1929. In total area, Peru is equal to nearly all of the Pacific-coast states of the United States plus Texas.

The People. The population of Peru is about 6,150,000; about half of this number are pure Indians, the native race, and the remainder are quite evenly divided between the whites of unmixed blood (chiefly Spanish) and the *mestizos*, or mixtures of European and native stocks. The whites represent the culture of Spain; and the Spanish language is spoken with a purity unequaled elsewhere in America. The Indians, who are descendants of the original Quichuas, are industrious farm laborers, or shepherds, mild in temper and not inclined to travel or to warfare. The mestizos are miners, freighters, and drovers. Large numbers of negroes were brought to Peru by the early viceroys, and they mingled with the Quichuas. Their mixed descendants are called *sambos*.

The Cities. There are several cities of populations between 15,000 and 30,000, including Trujillo and Ayacucho, but the larger ones of chief importance are the following:

Arequipa, *ah rah ke' pah*, an old city that has been conspicuous in the history of Peru It is situated on the Chile River in a region of fine, dry climate, 8,000 feet above sea level. Arequipa is one of the best-built cities in South America; it has good streets, a cathedral, two national schools, and a university. At a height of nearly 8,060 feet, a branch of the Harvard Observatory was constructed, but it has since been moved to South Africa to secure more favorable climatic conditions. The people are employed chiefly in the making of jewelry and the cutting of precious stones. The city is the center of trade for the interior. It was founded by Pizarro in 1540. In 1600 and again in 1868, it was nearly destroyed by earthquakes. Population, 55,000.



AREQUIPA, A PROSPEROUS CITY

The style of architecture is characteristic of all Peruvian cities There is no evidence in the illustration to indicate that the city is 8,000 feet—a mile and a half—above the sea

Callao, *kahl yah' o,* the chief port of Peru, is the shipping point for Lima, the capital, which is seven miles east The site of the city is a flat, rocky shelf, only eight feet above the sea level Sea breezes keep the temperature moderate, but the city as a whole is not attractive for residence by reason of its narrow, irregular streets and its lack of good pavements, modern sanitation, and adornment. The harbor is excellent, having the best of docking facilities and fortifications. It is a port of entry, and its maritime importance is being greatly advanced by the Panama Canal, which brings it relatively near to North Atlantic ports. There is some manufacture of iron and sugar-refining, but Callao is chiefly a trade center, exporting sugar, cotton, wool, hides, minerals, cocoa, etc., and importing manufactured cotton and wool, iron and steel. Most of the commerce is with Great Britain.



LOCATION MAP

Showing Peru's position in South America and the relative portion of the continent occupied by the country

Callao has quite a romantic history, figuring in the pirate activities of the sixteenth century, and in the early Spanish conquests Earthquakes shook the city in 1630 and 1746, the latter of which destroyed it. Callao was rebuilt and strongly fortified, and remained the last foothold of Spain on the continent until 1826, when the Spaniards were driven out. In 1881 Chile possessed the city, but Peru regained it two years later, after the Battle of Miraflores. Estimated population, 66,000.

Cuzco, *koos' ko,* a city far inland in South-Central Peru, is in the center of a fertile agricultural district in the Andes. It is 11,300 feet above sea level, and although only 14° south of the equator, has a mild and inviting climate. Important manufactures of woolen and cotton goods, sugar, embroidery, and leather are carried on, and there is an extensive inland commerce. Cuzco is one of South America's oldest cities, having been founded in the eleventh century, and at one time was the capital of the empire of the Incas The ancient city was stormed and destroyed by Pizarro in 1535, but remains of its former glory are seen in the palace of the Incas and a mighty Temple of the Sun, the object of their worship. The modern city is well built. In 1927 engineering works were completed which bring adequate water supply from a distance of twelve miles. Population, estimated, 35,000.

Lima, *le' mah,* the capital of Peru, is famous in history as the former capital of all Spanish South America, and its name is known even to the uneducated of a great part of the world through the familiar lima bean, first grown here and named for the city.

Lima was founded by Pizarro, the Spanish conqueror, in 1535, and named by him the "City of

Kings." Its present name is a corruption of *Rimac*, belonging to the river on whose bank the city is built. The early city was surrounded by adobe walls, but these were razed in 1870, a date that marks the beginning of modern Lima. The city is near the coast, in an almost rainless region, where the air nevertheless is moist with dews and with vapor from the sea. The climate is delightful except in the winter season, June to September, when dense fogs prevail.

The city has suffered periodically since 1683, from destructive earthquakes, that of 1746 being especially memorable The houses as a rule are built of adobe several feet thick, to make them earthquake-proof, and are stuccoed with plaster They usually follow Spanish architecture, with central courtyards. But there are many beautiful buildings, including the cathedral, and scores of churches, rich in costly decoration The palace, or government building, progressively constructed, is filled with the accumulated memorials of four centuries, and is especially interesting for its great collection of portraits of historic characters. In one of its *patios* (courtyards of buildings) is an ancient fig tree which Pizarro himself planted. Handsome promenades and public squares, together with the Botanical Garden and exposition grounds, help to beautify the city Electric lights, an adequate sewerage system, and a splendid water supply give evidence that it is developing into a modern city.

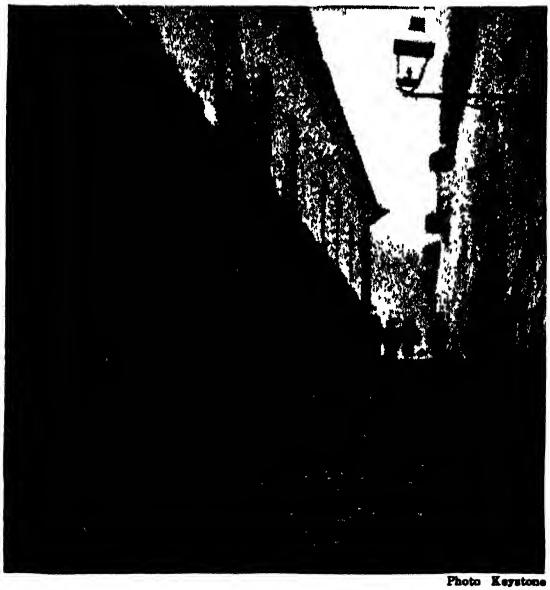


Photo Keystone

BY THE WALL OF AN OLD PALACE OF THE INCAS

The streets are narrow; the Indians have worn the same kind of costume for centuries.

Music, art, and belles-lettres are liberally patronized in Lima. The oldest university in America, that of San Marcos, founded in 1551, is located here. The city is widely known for its manufacture of cotton and woolen textiles, sugar, and cocaine, and for its marble factory

The retail trade is largely in the hands of Italians, who are numerous. There are many Americanized Chinese families, some of which are wealthy and have long been residents of the city. The population is estimated at 260,000, including suburbs.

Physical Features and Climate. Two ranges of the mighty Andes Mountains cross Peru from north to south, dividing the country into three distinct regions. The coast strip is a rainless region, mostly desert, where agriculture is impossible without extensive irrigation, for the winds (from the east) part with their moisture when passing the cold mountain tops. Between the mountains is a region of plateaus, varied with deep valleys and lofty summits; in the main, the climate is mild and healthful, and the greater part of the population find their home here. East of the mountain region lies the "montana," a tropical zone watered by many rivers, including the headwaters of the Amazon, and covered with thick forests which are valuable for their varied products. The condor, llama, fox, and deer dwell in the mountain regions; the monkey, alligator, and tiger in the tropical districts. The Andes reach their highest altitudes in Peru, with seven peaks over 19,000 feet high.

Resources and Industry. Peru is a vast storehouse of minerals, still scarcely exploited, yet constituting the chief source of the country's wealth. Copper is first in rank, and is followed by petroleum, silver, gold, coal, and vanadium. Lead and antimony are also produced. Cerro de Pasco is a famous mining region. The district near Lake Titicaca is noted for its immense quantities of oil. At Pachacamac are the quarries of a beautiful marble, among the most rare and costly in the world. Vanadium was found in 1904, and Peru now supplies about seventy per cent of the world's output of that metal, all of which goes to the United States. Guano, for fertilizing, is a source of wealth, and sulphur is exported in considerable and increasing quantities.

The leading agricultural products of Peru are sugar, cotton, wool, hides, and skins. Wild rubber collected in Peru was formerly an important export, but with the cultivation of rubber, this industry passed in Peru, and those engaged in it turned to cotton. Irrigation is necessary to agriculture in many regions, and the government coöperates to develop it. Cotton is picked in the early months of the year. Cocoa cultivation is being extended, and the manufacture of wines is becoming important. Coffee, tobacco, Indian corn, wheat, and ramie are cultivated in the higher regions. Here, also, is the original home of the potato. In the southern part of

the country the grazing lands produce a low grade of wool, which is sent for the most part to Liverpool.

The forests, not yet fully exploited, yield rubber, cinchona, and dyes; and the mountain valleys afford grazing for the alpaca, sheep, and llama. Sugar and cocaine comprise the chief manufactures. Cigarette and chocolate factories are becoming more numerous. The Indians are noted for the manufacture of straw hats, sold as Panamas.

Commerce. Since the opening of the Panama Canal, the United States has led all other nations in supplying Peruvian imports. Trade is also carried on extensively by Peru with the United Kingdom, Germany, Argentina, Italy, France, and Chile. The need for irrigation and the difficulties of transportation, however, retard the development of commerce. Roads and railways are being rapidly constructed; the government controls over 1,500 miles of railroad, and about 1,000 miles are privately owned. There is still much to be done before the more mountainous regions and vast forests can be penetrated except by pack mules. A tax of four cents per gallon on gasoline is applied to road-building. Air service exists between Lima and Iquitos. The seaports are generally supplied at least with short lines into the interior.

Education and Religion. Elementary education is free and compulsory between the ages of seven and fourteen. There are twenty-seven colleges, various high schools, and institutions of applied science.

Nearly all the inhabitants are Roman Catholic. Although this faith was formerly enforced by the Inquisition, since 1920 religious liberty has prevailed throughout the country.



COMPARATIVE AREAS

Peru is much larger than all of the North American area shown Nearly all of Texas could also be laid down within its boundaries

Government and History

Government. The new Constitution of January 18, 1920, offers more decentralized government than the old, by which all internal affairs were managed by the central government. Provision is now made for three regional congresses, in the north, center, and south, and deputies for each are chosen by the provinces; in addition, considerable local autonomy is granted. The executive department is headed by a President elected for five years, and according to an amendment of 1927, he may be eligible for reëlection as long as he has the confidence of the people. He is assisted by a Cabinet of seven Ministers appointed and removed by himself. The bicameral legislature, or Congress, has thirty-five Senators and 110 Deputies, but the membership of the houses may be changed by constitutional amendment. These officials are elected by popular vote. Municipal councilors are also elected by direct vote, and foreigners are eligible to the office. The judicial department functions from the Supreme Court at Lima, in which there are eleven judges and three fiscals chosen by Congress from lists recommended by the government.

The present Constitution lays particular stress upon social guarantees, a new departure in Latin-American policies. For the first time, the government has recognized its duty in regard to the native race.

History. For about three centuries, Peru was the center of a vast empire, ruled over by a powerful family of Peruvian Indians, known as the Incas (see INCA). That this ancient Indian civilization had reached a high degree of development is evident from the ruins revealed by recent expeditions. But with the coming of the Spaniards, led by Pizarro, the Inca empire was overthrown, and the people were reduced to slavery to satisfy the conquerors' thirst for gold. And for many succeeding centuries, Peru was the scene of plunder and adventure. The ruthless conqueror, Pizarro, was not typical of Spanish culture or character, for once he had been a nameless outcast infant whom tradition says a sow had suckled with her pigs in the streets of Trujillo,

Spain. He was a combination of greedy ambition and brutal ferocity. In 1532, with "a handful of men, without food, without clothing, almost without arms, without knowledge of the land to which they were bound, without a vessel to transport them," he encamped on the island of Gallo, off the Peruvian coast, planning there the overthrow of the great, prosperous, peaceful land of the Incas.

His men, unable to dissuade him, or to reach the Spanish governor at Panama with their protest, resorted to strategy. They sent back on the governor's ship, as a present to the governor's wife, a large ball of coarse yarn which they manufactured in some way, and in the heart of which was concealed a note telling of their distress. The quick-witted lady unwound the yarn and read the message; then induced the governor to recall them. The recall was ignored. Pizarro took the governor's ships and landed on the coast. In one encounter with the natives, his party was saved by the accident of a horseman's falling from his steed; for the natives had supposed man and animal together to be but a single being, and, stunned by amazement at seeing it thus separated into parts, they permitted the invaders to escape at the time. Pizarro seized the Inca, or sovereign, and eventually put him to death.



Photo U & U

THE MOUNTAIN HARVESTER IN THE ANDES

Peruvian Indians harvest their grain by the most primitive method known—that of tossing grain and chaff into the air. The wind will blow the chaff away, and the heavier grain will fall to the ground

Having need to send his horsemen to Xanca, to capture the Inca's chief aid, Pizarro found it absolutely necessary for his horses to be shod. Iron was unknown, and the resourceful leader had them shod with solid silver. Gold was plentiful. To one soldier fell, as a spoil, an immense gold image of the sun, with rays, or streamers, on the wall of a great temple. This was a large fortune, but in the madness of the hour its new possessor gambled it away in a single night, thus giving rise to the Spanish proverbial expression, "to gamble away the sun before the sunrise."

W. H. Prescott's *Conquest of Peru*, an American classic, everywhere familiar, relates the story of the marvelous conquest in interesting detail.

The history and all the learning of the Inca population were preserved among that strange people, not by picture writing (as in Mexico), but by memory, aided by a strange system of *quipus*, or cords, variously knotted and colored. Every knot, every color, meant something to be remembered; and the *quipu* system of recording events was more or less efficient for meeting all the needs of that peculiar civilization.

Cuzco, the capital of the Incas, has been rendered somewhat familiar as a subject in many lands through dramas portraying the conquest. A classic drama bearing the title *Ollanta*, written by a Spaniard in the seventeenth century and translated into English by Sir Clements R. Markham, came into world-wide fame in 1837. It presents a vivid picture of the life of the Quichuas, the Inca's people, in centuries long past; and, being based on facts carefully preserved by legend, it lends interest to the ancient palace (visited by tourists today) which supplied some of its heroic scenes. Ollanta, the mountain chieftain, and Cusi, the Inca's daughter, are the hero and heroine.

In the palace at Lima, the modern capital, is an unbroken line of portraits of all the forty-four Spanish rulers of Peru from Pizarro (1533) to Pezuello (1824), with whom Spanish rule ended. The line of viceroys included great and good men. Gasca (in the middle part of the sixteenth century), who abolished slavery, has been compared to George Washington; and to the historian Prescott he seemed to have been raised up by Providence for his noble work.

Some women have been conspicuous in Peruvian history. The Señora Maria de Escobar, of Pizarro's native city of Trujillo, brought from Spain an abundance of wheat for seed,



Photo: U & U

A Village Market. Such scenes are common throughout Peru In the illustration there may be seen on sale in the foreground blankets, shoes, ice cream, cakes, and vegetables. The lady and her small son may be "window-shopping."

Outline and Questions on Peru

I. Size and Position

(1) Area
  (a) Actual
  (b) Comparative
(2) Location in continent
(3) Bordering countries

II. Physical Features and Climate

(1) Three topographic zones
  (a) The rainless coast strip
  (b) The fertile plateaus
  (c) The eastern slope
(2) Climate

III. Industries and Communication

(1) Agriculture
  (a) Chief crops
(2) Mining
  (a) Copper
  (b) Vanadium
  (c) Other minerals
(3) Railways
(4) Transportation by pack mules
(5) Commerce

IV. The People

(1) Population
(2) Races
  (a) Natives
  (b) Whites
  (c) Mestizos
(3) Education
(4) Cities
(5) Government
  (a) Republican form

V. History

(1) The civilization of the Incas
(2) The Spanish conquest
(3) Independence achieved

Questions

Who were the Incas? Describe their civilization and give some details of the conquest by which it was overthrown.

How did the country receive its name?

How many of the South American republics are larger than Peru? How many have a larger population?

Are all these larger countries more populous?

What are *mestizos?*

How does the Spanish of the cultured Peruvians compare with that of the inhabitants of other countries of the western hemisphere?

Who are the *sambos?*

What is the "City of Kings," and who founded it?

Why is the westernmost part of Peru practically rainless?

From what nation has Peru in recent years received most of its imports?

When was an important message sent in a ball of yarn?

When and why did the fall of a rider from his horse save an army from destruction?

and taught the natives to use this cereal. She also led her friends to establish real homes of culture, rather than camps of adventure. The Condessa (countess) of Chinchon, wife of one of the sixteenth-century viceroys, being cured of a fever by a faithful native when her own eminent physician despaired of her life, devoted herself to spreading abroad through the world the blessing of the native medicine used in her case, which was the bark of a tree called *quinoquino.* Scientists have applied her name (somewhat altered) to the *cinchona* tree, and the medicine is called *quina*, or *quinine.*

The good work of faithful priests in moderating the rigors of rulers and in teaching the people useful arts, investigating plant and animal life, preserving the history, and promoting every good word and work, is lauded by Prescott, and presents a model of Christian activity outside of spiritual labors.

Though Spain contributed much in the way of culture and prosperity, its rule was barbarous, and Peru sought its freedom in the general movement for independence in Spanish America. The Spanish power in Peru, described above, was finally overthrown in the Battle of Ayacucho, December 9, 1824, in which General Sucre, an aid of Bolivar, commanded the patriots.

The first twenty years after independence were characterized by constant strife between factions under ambitious leaders. In 1849, however, Ramón Castilla, Peru's greatest President, came into power, and for the next twenty years, Peru's progress was marked. In the war with Chile (1879-1883), Peru lost its valuable nitrate province, Tarapacá, and the dispute over Tacna and Arica was settled only in 1929, after nearly half a century of dispute. According to the award, Peru was given Tacna and control of the railroad between Tacna and Arica (see TACNA-ARICA AWARD). The following year marked the beginning of more friendly relations between Chile and Peru, and their diplomatic relations were reëstablished. W.W.S.

Related Subjects. The reader who is interested in Peru is referred in these volumes to the following articles:

Andes	Pizarro, Francisco
Flag (color plate)	Quinine
Guano	Titicaca, Lake
Inca	Vanadium

PERU, IND. See INDIANA (back of map).

PERU, MARVEL OF. See FOUR-O'CLOCK.

PERUGINO, *pa roo je' no,* PIETRO (1446-1524), a celebrated Italian painter and representative master of the Umbrian school. He was one of the first of the early Italians to adopt with success the Flemish method of oil painting, and none of his pupils, except Raphael, attained the deep purity of coloring which is characteristic of his art. His real name was PIETRO VANNUCCI. He was born

at Citta della Pieve in Umbria, and accomplished most of his work in the neighboring city of Perugia, whence his historic name. In 1483 Pope Sixtus IV called him to Rome, where he was employed with other famous artists in decorating the Sistine Chapel with frescoes. Perugino's fresco *Christ Giving the Keys to Peter* is the best of those still visible, three of the others having been destroyed to give space for Michelangelo's *Last Judgment*. Other specimens of his work are preserved in Perugia, Rome, Bologna, and Florence. His altar-piece in the National Gallery, London, was originally painted for the Certosa Convent at Pavia. Many other European galleries treasure specimens of his art.

PERUVIAN BARK, the bark from several trees of the cinchona family, valued for the quinine it contains. For a description of the trees, see CINCHONA; for the drug, see QUININE.

PESCADORES, *pes kah-do' res*, THE. See JAPAN (Location and Size).

PESCENNIUS NIGER. See SEVERUS.

PESETA, *peh sa' tah*, the monetary unit of Spain. At par it is worth 19.3 cents of United States money, having the same value as the French *franc* or the Italian *lira* before the World War. One peseta is worth 100 centimos. Gold coins having the value of five, ten, twenty, and twenty-five pesetas are made, and silver coins having the value of fifty centimos and of one, of two, and of five pesetas. The silver one-peseta piece has on one side the head of the king, and on the other the coat of arms of Spain. See MONEY (Foreign Monetary Standards).



Photo: U & U

STATUE OF PESTALOZZI
It stands in his native city, Zurich.

Derivation. The word is the diminutive of *peso*, the name of a large gold or silver coin once used in Spain and its colonies; *peso* comes from *pensum*, the Latin for *weight*. See PESO.

PESHKOV, ALEXIS MAXIMOVITCH, the real name of Maxim Gorki (which see).

PESO, *pa' so*, originally, the name of the old Spanish dollar, called *peso de oro*, or *peso de plata*, according as it was coined of gold or of silver. In Spain the peso is no longer the standard of value, its place having been given to the peseta (which see), but it retains its importance as a monetary unit in the Spanish-American countries. Thus, in most of the states of South and Central America, as well as in Mexico, the silver peso, or dollar, is still the standard, though varying considerably in value. In the Philippine Islands, before they were acquired by the United States, the monetary unit was the peso, worth $0.50.

[For the par values of the peso in various countries, see the article MONEY (Foreign Monetary Standards).]

PESSIMISM, *pes' ih-miz'm*, the philosophy which holds that there is more bad than good in the world and more pain than pleasure. In its contention, therefore, that the world is essentially evil, it is the opposite of *optimism*, or the belief that this is the best possible world. There are many grades and variations of pessimists, including those who feel that the hereafter is very uncertain and determine to enjoy all of the present; those who think that the world is steadily decaying; others who feel that man himself is as bad as possible and beyond redemption; and still others who hold that bad as man is, he may become immaculate in the hereafter. Strictly speaking, pessimism is more a personal attitude than a philosophy. Modern thought, being concerned with the intrinsic value of life, phrases the problem principally in the question of whether life is worth living. Arthur Schopenhauer, a German philosopher, was the most famous modern pessimist. See OPTIMISM; PHILOSOPHY.

Derivation. The word *pessimism* has come into the English language from the Latin *pessimus*, which means *worst*.

PESTALOZZI, *pes tah lot' se*, JOHANN HEINRICH (1746-1827), one of the world's greatest educational reformers, was born at Zurich, Switzerland. His father died when Johann was five years of age, and he was brought up by his mother and a devoted servant, who shielded him from contact with other boys and society in general. He was a shy, delicate, and awkward boy, and his early training tended to emphasize these characteristics. Later, he passed through the Latin school at Zurich and the

public college. Pestalozzi possessed an ardent love for his country and the people, and when a youth, he resolved to do all he could to relieve the poor. It was in his attempts to carry out this resolution that his work as an educational reformer began.

He first decided to be a minister, but abandoned that plan to follow the law, because he thought that he could render the people greater service by defending them in the courts. His health became broken by hard study, and he settled on a farm at Neuhof, in Aargau. However, a man of his brilliant and erratic gifts was ill adapted to the life of a farmer, and after seven years, he was heavily in debt.

Early Attempts in Education. Pestalozzi converted his farm into an industrial school for the poor children of the neighborhood, that they might be enabled to earn their living. He taught all his pupils reading, writing, and arithmetic. The boys received instruction in farming, and the girls in gardening, housekeeping, and sewing. Religious education was also emphasized. The pupils were to earn their support, and pay something toward the expenses of the school by cotton-spinning, but Pestalozzi's lack of business ability caused the enterprise to fail.

At about the time that the school of Neuhof failed, the French invaded Switzerland, and a large number of the inhabitants were massacred. A deserted convent was converted into a poorhouse for scores of orphans, and Pestalozzi was asked to take charge of it. Here, under the most unfavorable conditions, he achieved successes that delighted and amazed those who visited the institution. After six months, however, the building was taken over by the authorities for a military hospital.

Burgdorf and Yverdun. In 1799 Pestalozzi and an associate opened at the Castle of Burgdorf a college for the training of teachers. A secondary school, an elementary school, and an orphan asylum were included in their plans and connected with the college. The staff of instructors was increased by a number of men who did much to strengthen the organization and systematize the management. This school soon became the center of educational experiments, investigation, and training hitherto unknown. After four years, the institution was removed to Yverdun on Lake Neuchâtel, where it continued until 1825. The first five years of this period were characterized by brilliant success, and the school became internationally famous. To it came statesmen and teachers from all the countries of Europe and from America, to learn the methods and ideas of the great educator. Dissensions among the faculty, which Pestalozzi was unable to control, caused the school to decline and finally to close. Two years later, the founder died, disappointed and poverty-stricken.

Pestalozzi's Influence. Pestalozzi was a pioneer teacher of the method of instruction that is based on psychology.

He believed that the principles of education were to be found in human nature, and that the child's physical, intellectual, and moral capacities should be trained. He advocated industrial training along with training in subjects commonly taught in the schools, and placed great stress upon sense training. Objects, the study of nature, and lessons from the pupil's daily experiences were to him as valuable as lessons found in books. His method, emphasizing discovery on the part of the child, led to an all-around development that previous methods of instruction had not reached.

His Writings. Pestalozzi's books were upon political and educational topics. His most important educational works are *The Evening Hours of a Hermit*, *Leonard and Gertrude*, and *How Gertrude Teaches Her Children*.

PÉTAIN, HENRI PHILIPPE (1856-), a French soldier, one of the great military leaders of the World War. He had attained only the rank of colonel when the war broke out, and was then on the retired list. Though he had gained no fame as a soldier, his military abilities were known to Joffre, and he was placed in charge of a brigade that, under his direction, won distinction in the retreat from Charleroi to the Marne. Just before the Battle of the Marne, General Pétain was promoted to be a general of division. This was in September, 1914.



Photo U & U

MARSHAL PÉTAIN

Pétain was soon made commander of an entire army corps, and after displaying admirable judgment in the Artois and Champagne campaigns, he was made chief commander of the armies defending Verdun, in the spring of 1916. When Pétain held his ground here, in one of the greatest assaults in all history, the French people knew that the war had brought to the front a military genius of first rank. During the first few days, he directed operations from a sick bed, as he was ill of pneumonia.

General Pétain was made chief of staff in April, 1917, and about two weeks later, succeeded to the supreme command on the western line of battle. When, in 1918, Marshal Foch assumed command of the entire allied armies, General Pétain loyally coöperated with him, and was responsible for several of the offensives

that forced the Germans back. Shortly after the Armistice, in November, 1918, he received from the President of France the baton of marshal, a rank also awarded Foch and Joffre.

In the summer of 1925, Marshal Pétain was ordered to Morocco to supervise the arrival and disposal of the troops sent there to fight in the Riffian campaign. See VERDUN, BATTLES OF; WORLD WAR.

PETAL. See FLOWER (Flower Structure).

PETER, or SIMON PETER. See APOSTLES.

PETER, EPISTLES OF. The *First Epistle* is believed to have been written in Rome in the year A.D. 65, after the burning of the city by Nero. In this series of letters, Peter is writing to Jewish Christians, especially. It is assumed that one Silas, or Silvanus, was Peter's amanuensis, and that he was the bearer of the *First Epistle*. The *Second Epistle* is considerably different in style, but bears many marks of genuineness. It is supposed that Silas, when writing the *First Epistle*, smoothed out much of the Apostle's uncouth Greek. The *Second Epistle* was written in the vernacular, as Peter was an unlearned fisherman, and not a scholar, as was Paul. Peter died about A D. 68; hence his *Second Epistle* must have been written between 65 and 68. See APOSTLES.

PETER I, ALEXEYEVITCH (1672-1725), known as PETER THE GREAT, was the most notable of the Russian emperors To him, more than to any other one person, the growth and greatness of Russia were due. He was the son of the Czar Alexius Mikhailovitch by his second wife, and in his youth his half-brothers, Feodor and Ivan, stood between him and the throne. Feodor, who died in 1682, designated Peter as his successor, but Sophia, sister of Ivan, desired to have her brother crowned, because he was weak-minded and would permit her to rule. At length both brothers were crowned, but in 1689 Peter forced Sophia to resign the government and enter a convent, while he himself became in reality sole ruler, though associating Ivan's name with his own until Ivan's death, in 1696.

Sought Education and Efficiency. Peter saw clearly what he wished to accomplish for Russia, and what obstacles stood in his way. His education had been of the most casual sort, and any subject of which he wished to make use in his government he had to learn from its foundation. No difficulties ever daunted him, however, in his task of making Russia a country worthy of recognition by other nations. If he was to meet the Western states of Europe on an equal footing, he must have an organized fighting force, and reorganization of the army on the German model was the first reform which he set in motion. Then, too, he desired for Russia a navy, and an outlet for that navy on ice-free waters. In pursuance of this design, he took Azov from the Turks in 1696, thus gaining a port on the Black Sea.

Peter brought artisans, engineers, and soldiers from other countries, but they could not teach him all he wished to know, and in 1697 he set out on a tour of Europe, tarrying wherever he could learn anything which he felt might be useful to him. Gunnery, shipbuilding, anatomy—he acquired more than a superficial knowledge of these and of many other subjects; nor was he above working as a carpenter in the shipyards in Holland, that his knowledge might be of the most practical kind. Before he had completed his travels, he was recalled to Russia by a rising of the imperial guard, which he put down with great severity.

No subject was too trivial to feel the effects of Peter's reforming energy. He ordered his subjects to adopt European dress, instead of the flowing Oriental costumes, and he taxed beards and mustaches to discourage the custom of wearing them. But he did not confine himself to such externals; he encouraged foreign commerce; reorganized the Church, making himself its head; reformed the calendar; and released women from their almost Asiatic seclusion. Nor did he cease his struggle for open ports.

National Projects. To secure access to the Baltic Sea, Peter entered upon a contest with Sweden which lasted from 1700 to 1721. In his first battles with Charles XII, he was utterly defeated, but he expected such an outcome, and persisted until, in 1709, he gained complete victory at Poltava. Two years later, however, in a war with the Turks which Charles XII had instigated, he suffered reverses, and lost Azov. Meanwhile, in 1703, Peter had begun the construction of his new capital, Saint Petersburg, renamed Petrograd in 1914 and Leningrad in 1924, on territory which he had wrested from the Swedes, and in 1712 transferred his government from Moscow to that city, to the great indignation of the old nationalist party. Peace with the Swedes was not signed until 1721, but by it Russia gained Livonia, Estonia, Ingermanland, Karelia, and part of Finland. In the same year, Peter was proclaimed emperor of all Russia and "Father of the Fatherland." He was thus really the first of the czars.

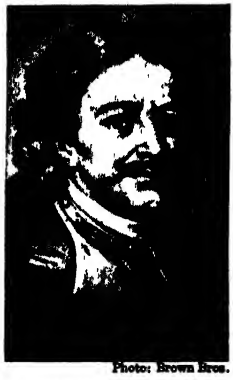


Photo: Brown Bros.

PETER THE GREAT

The most notable of all of Russia's sovereigns and the greatest of the Romanoffs, which dynasty ruled the country from 1613 to 1917

His Character. That Peter's intense desire for civilization did not free him from barbarous instincts and passions is shown by his cruelty toward anyone who incurred his disfavor. Because he thought that his own son was encouraging the reactionary party, Peter had him condemned to death, and though he afterward pardoned him, the prince died from the effects of the tortures which had been inflicted upon him. A few years after marrying, he drove his wife from him because the two differed on policies of state, as well as on personal matters; she displayed autocratic and reactionary tendencies which threatened to nullify some of the reforms he instituted. In 1712 he married his mistress, Catharine, who succeeded him upon his death, in 1725, as Catharine I; she had been crowned in the preceding year, that her succession might be assured.

Peter's rages were terrific, but he never allowed them to lead him into courses that would injure his nation. Unlike other rulers who have attempted reforms in Russia, Peter did not attempt to force upon his barbarous or half-civilized people institutions or principles which were beyond their comprehension.

Related Subjects. The reader is referred in these volumes to the following articles

Catharine (I, Russia)	Leningrad
Charles (XII, Sweden)	Russia (History)

PETER I, KARAGEORGEVITCH (1846-1921), a king of Serbia who lived to see his country freed from Turkish rule and eventually a part of the new kingdom of Yugoslavia. Peter was born in Belgrade, capital of Serbia. In 1858 his father, Prince Alexander, was forced to abdicate through the intrigues of a rival dynasty, and the boy was taken to Hungary to be educated. Later, he was graduated from the French military school of Saint-Cyr. While serving as an officer in the French army during the Franco-German War, he was captured three times by the Germans, but each time escaped. Largely through Peter's influence, the Balkans were encouraged in the revolt which led in 1877 to the Russo-Turkish War and terminated in independence for Serbia. In 1882 Peter witnessed the establishment of Serbia as a constitutional monarchy. He became connected with the rulers of Russia and Italy through his marriage in 1883 to Princess Zorka, daughter of Prince Nicholas of Montenegro. They lived quietly together at Cettinje, and after Zorka's death, Peter removed to Geneva.

There were several changes of rule in Serbia following the abdication of Prince Alexander, in 1858. In 1903 the ruling king, Alexander Obrenovitch, and Queen Draga were assassinated, and the house of Karageorgevitch was again placed on the throne in the person of Peter, who assumed the title Peter I. During his long reign, popular sentiment for the union of the Slavs within a Greater Serbia steadily increased, and it was the agitation in behalf of this movement that led to the assassination of the heir to the throne of Austria, in 1914. The victory of Serbia in the Balkan Wars had also inflamed patriotic feeling.

In June, 1914, King Peter's poor health forced him to name Crown Prince Alexander as regent. Within a few weeks, Austria-Hungary declared war on Serbia, and the great World War had begun. When, in 1915, Austrian, German, and Bulgarian troops overwhelmed the little kingdom, Peter and Alexander accompanied the Serbian troops in the dreadful retreat across Albania. The aged king lived in retirement until his death, in 1921, but Serbian interests were ably managed by Alexander, who became king of Yugoslavia in 1920.

Related Subjects. The reader is referred in these volumes to the following articles

Alexander I	Russo-Turkish Wars
Austria-Hungary	Serbia (History)
Balkan Wars	World War
Montenegro	Yugoslavia (History)

PETER PAN. See BARRIE, SIR JAMES M.

PETERS, SAMUEL, an exiled New England minister responsible for exaggerations respecting the blue laws (which see).

PETERSBURG, SIEGE OF. See WAR OF SECESSION.

PETERSBURG, VA. See VIRGINIA (back of map).

PETER'S PENCE, the name applied in the Roman Catholic Church to voluntary offerings for the support of the Pope. The custom is said to have originated in England in Saxon days, and to have spread from there to the Continent, although it was not definitely established until the middle of the eighth century, and was abolished by Henry VIII. The Seventh Provincial Council (Baltimore, 1849) approved the collection of Peter's pence in the United States. See POPE.

PETER THE GREAT. See PETER I (Russia).

PETER THE HERMIT (about 1050-1115), a monk of Amiens, famed as the preacher of the First Crusade. He was born in the diocese of Amiens, but little is known of his life from that time until 1095, when he began to urge the necessity of a crusade to wrest the Holy Land from the infidel. Convinced that it was his mission to inspire men to regain possession of Palestine, he rode about France on mule back, dressed in a monk's cloak of rough cloth, and bearing in his hand a crucifix. In 1096 he set out with about 30,000 undisciplined followers, mostly from the poorer classes. They straggled on through Europe, but after crossing the Bosporus into Asia Minor, proved so



Photo: Visual Education Service; from the painting by Archer

PETER THE HERMIT PREACHING THE CRUSADES

unruly that Peter left them and joined the army of Godfrey de Bouillon. He had a part in the capture of Jerusalem, and in July, 1099, preached on the Mount of Olives. See CRUSADES.

PETIOLE, *pet' ih ole.* See LEAVES.

PETITE ANSE ISLAND. See LOUISIANA (Minerals)

PETITION, *pe tish' un,* a formal written request soliciting some right, grant, or favor, and made to a legislative body or to an official who has power to grant it. The right of petition is one of the fundamental privileges of a free people, and is regarded by them as a national right. It lies within the discretion of the executive or legislative body to decide how such petitions shall be received, as no formal method has ever been provided for their reception. Petitions were first presented to secure purely private ends, but such requests are now frequently addressed to the courts to bring attention to special matters. In such cases, it is a rule that an affidavit must also be made that the facts alleged are true, as far as known to the petitioner.

PETITION OF RIGHT. When, in 1628, the English Parliament drew up a restatement of the principles of the Magna Charta and presented it to King Charles I, one more milestone in the progress of English liberty was reached. This restatement of political rights is known in history as the Petition of Right. Charles I, a fervent believer in the divine right of kings, was attempting to use Parliament as an instrument to accomplish his autocratic purposes. But he needed money for personal and political purposes, and the only way he could raise the necessary funds was to get the Commons to vote appropriations. Accordingly, Parliament met in adjourned session early in 1628. Again there was refusal to vote supplies until the king would promise redress of grievances. To make its position clear, the Parliament drew up the Petition of Right. Among the wrongs complained of were the levying of taxes without the consent of Parliament, the quartering of soldiers in private houses, the establishing of martial law, and the imprisonment of citizens illegally. The necessities of the king were so pressing that he ultimately accepted and signed the Petition, but he had no intention of adhering to its provisions, and his high-handed methods ultimately brought about his own execution, which final chapter in his life occurred in 1649.

The Petition of Right had important results, though its immediate objective was not attained. It solidified popular sentiment, gave the opposition a rallying point, and thus hastened the triumph of constitutional rule, which was established in 1689, when William III signed the Bill of Rights.

Related Subjects. The reader is referred in these volumes to the following articles:

Bill of Rights	Divine Right of Kings
Charles (I, England)	Magna Charta

PETIT JURY. See JURY.

PETIT MAL, *peh te' mal'.* See EPILEPSY.

PETIT TRIANON, *tre ah noNg'.* See MARIE ANTOINETTE; VERSAILLES.

PETRA, *pe' trah,* an ancient city of Northern Arabia which has been called "a rose-red city half as old as time," because of the color of the walls of rock which enclosed it on all sides. Since its rediscovery, in 1807, it has been a source of great interest to the student of ancient history, for its remarkable rock ruins tell of a former great power and culture. The walls of the gorge of red sandstone rise from 100 to 200 feet, and along their sides are to be seen rows of cave tombs hewn out of solid stone and ornamented with façades.

Petra owes its Greek name to its peculiar character as a rock city; the word is possibly a translation of the Greek for *rock.* Between the second and third centuries, this marvelous rock city was in the hands of a mysterious Arabian race, the Nabataeans, who held in their power the important caravan trade route between the Dead Sea and the Red Sea. Petra stood in a narrow gorge overhung by mountains along this route, and the Nabataeans made it the capital of a prosperous trading empire. Inscriptions left by its rulers are still to be found. In 106 A.D., Emperor Trajan reduced Petra to the rank of a Roman province, and during the Roman supremacy, numerous fine buildings were erected. For many years Oriental trade continued to the benefit of Rome, but when the Nabataeans secretly diverted desert traffic to Palmyra, in Syria, the importance of Petra began to wane. It was conquered by the Moslems in the seventh century, and gradually fell into decline.

The most beautiful of the ruins of temple tombs are the Temple of Isis (The Treasury). An amphitheater capable of seating some 5,000, and the Deir, or convent, hewn out of the side of a cliff, are in comparatively fine state of preservation. On the face of near-by cliffs are carvings of entrances to temples and tombs, the interiors of which are now only rock caves. See ARCHAEOLOGY (full-page illustration of the Temple of Isis).

PETRARCH, *pe' trahrk,* FRANCESCO (1304-1374), an Italian poet and classical scholar, born at Arezzo of a family named Petracco. From this name the poet himself adapted the form by which he is commonly known, as he considered the latter more musical. Francesco's father was a political exile from Florence, and consequently the boy spent much of his childhood wandering from city to city. He was sent to Montpellier, France, in 1310, to study law, and four years later to Bologna for advanced study in the same subject, but his secret intention was to devote his life to literary work. His father opposed this love of writing, and on one occasion attempted to burn all the son's books of poetry, as well as the manuscripts which the young man had written, but Francesco's pleadings caused him to relent and allow the half-burned treasures to be taken from the fire. The father died in 1326, and Petrarch thereafter gave most of his time to literary pursuits.

While at Avignon, France, in 1327, he saw the woman Laura, in whose honor he wrote nearly every poem for which he is now remembered. Facts about her life are a little uncertain, but scholars have identified her as Laura de Noves, wife of Hugh de Sade. She was the mother of eleven children, and died of the plague in 1348. She inspired the writing of some of the noblest lyrics in all literature, and achieved for herself an immortal name. The poet seems never to have known her intimately, and his verses deal more with the ideal qualities of woman in general than with one in particular.



Photo Visual Education Service

PETRARCH

His Latin poems and prose had made Petrarch so famous by 1340 that both the University of Paris and the University of Rome offered him the laurel crown for poetry, and, choosing the honor from the latter institution, he was publicly crowned on Easter Sunday, 1341. He afterward wandered over Italy, serving various important Church and State patrons, and in his investigations, discovered several letters and two orations of Cicero. From time to time he went back to Avignon to be near Laura, and at one time bought a near-by estate at Vaucluse, with the same object. The news of her death caused him to write his *Triumphs,* among the most beautiful love poems in any language. During intervals of his life, he spent much time with Boccaccio, and a friendship developed which was a source of pleasure to both. After 1360 Petrarch spent his remaining years at Argua, near Padua, Italy, busy with his beloved books and manuscripts.

He prided himself on his Latin poetry, especially an epic, *Africa,* dealing with the adventures of Africanus; but these works are almost forgotten, while his Italian verses bid fair to outlast time. From that day in 1470 when his *Canzoniere,* or collection of songs,

was published at Venice, his influence over the poets of Europe has been too great to be estimated adequately. He gave the sonnet a dignified position in poetry, with new vigor, warmth, and nobility, while his refinement and art gave to Italian verse an importance it had never before enjoyed. See ITALIAN LANGUAGE AND LITERATURE.

PETREL. In the northern and southern hemispheres, but especially in southern regions, are found the birds that sailors call "Mother Carey's chickens." This name is possibly a queer Anglicizing of a Latin name for the Virgin Mary—*Mater cara*, meaning *dear Mother*. The common name of the birds—petrel—meaning *little Peter*, is derived from their habit of moving quickly and gracefully over the tops of the waves, as if they were



Up and down! Up and down!
From the base of the wave to the billow's crown,
And amidst the flashing and feathery foam
The Stormy Petrel finds a home—
A home, if such a place may be,
For her who lives on the wide, wide sea,
On the craggy ice, in the frozen air,
And only seeketh her rocky lair
To warm her young and to teach them spring
At once o'er the waves on their stormy wing!
—CORNWALL *The Stormy Petrel*

walking on the water. One of their peculiarities of structure is the possession of tubular nostrils. The petrels are the smallest of the birds that make their home far out on the sea, and are often seen in the wake of ships. They are fond of oil and fat foods, and flocks of them will follow a ship for many miles for particles of refuse. At night, wearied with the long journey, they nestle down upon the water and rest with the head under a wing. A single white egg is laid; the nests are usually made in holes or crevices of rocks, but sometimes a hole is burrowed in the ground near shore, and the egg placed at the end of the tunnel. The petrels, like the albatross, are regarded by sailors with superstition.

Wilson's petrel, a bird seven inches in length, nests in the Antarctic regions, but wings its way into the northern hemisphere on the approach of winter. Its plumage is a mixture of sooty black, gray, and white; the feet and bill are black, and there are webs of yellow between the toes. The long wings of this petrel, which are sixteen inches in extent, and its long legs, make it seem larger than it is. *Leach's petrel* is very similar in size and coloring, but it has a forked tail, while that of Wilson's petrel is square. Leach's petrels breed chiefly on the islands in the Bay of Fundy, and are not found farther south than Virginia or California. The *stormy petrel* is a tiny bird, not much more than five inches long, with a sooty black coat relieved only by touches of white near the tail and on the wings. It bears the distinction of being the smallest web-footed bird known, and is the petrel to which the name Mother Carey's chicken is more especially applied. The stormy petrel is a habitant of the European side of the Atlantic Ocean. D.L.

Scientific Names. Petrels belong to the family *Procellariidae*, in which are included the fulmars and shearwaters. Wilson's petrel is *Oceanites oceanicus*; Leach's is *Oceanodroma leucorhoa*; the stormy petrel is *Thalassidroma pelagica*.

PETRIE, *pe' trie*, WILLIAM MATTHEW FLINDERS, SIR (1853-), an English Egyptologist who has been professor of Egyptology at University College, London, since 1892. He founded the Egyptian Research Account in 1894, which was enlarged as the British School of Archaeology in Egypt, in 1905. Petrie was born in Charlton, Kent, and was privately educated. Early in life he evinced great interest in archaeological research, his first work being the investigation of the ancient British remains at Stonehenge. In 1880 he began a series of surveys and excavations in Egypt that have resulted in important discoveries. From 1884 to 1886, his excavations in the Nile delta brought to light the lost Greek city of Naucratis and the site of the Greek settlement at Daphnae. At Fayum he recovered papyrus rolls of great interest and value. In 1890 he discovered and investigated the ancient Lachish for the Palestine Exploration Fund. Subsequent discoveries included the first tombs of the first dynasty at Abydos and an earthwork camp city of the Hyksos kings. He made significant studies of the palaces of Memphis, and at Nagada he unearthed traces of a prehistoric people. See ARCHAEOLOGY (Egypt and Asia Minor).

Writings. The published accounts of Petrie's discoveries and investigations have a high standing among Egyptologists. His books include *The Growth of the Gospels*, *Arts and Crafts of Ancient Egypt*, *Some Sources of Human History*, *The Revolutions of Civilization*, *Religious Life in Ancient Egypt*, *Personal Religion in Egypt before Christianity*, *Social Life in Ancient Egypt*, *The Great Pyramid of Gizeh*, *Ten Years' Digging in Egypt*, and *Eastern Exploration, Past and Future*.

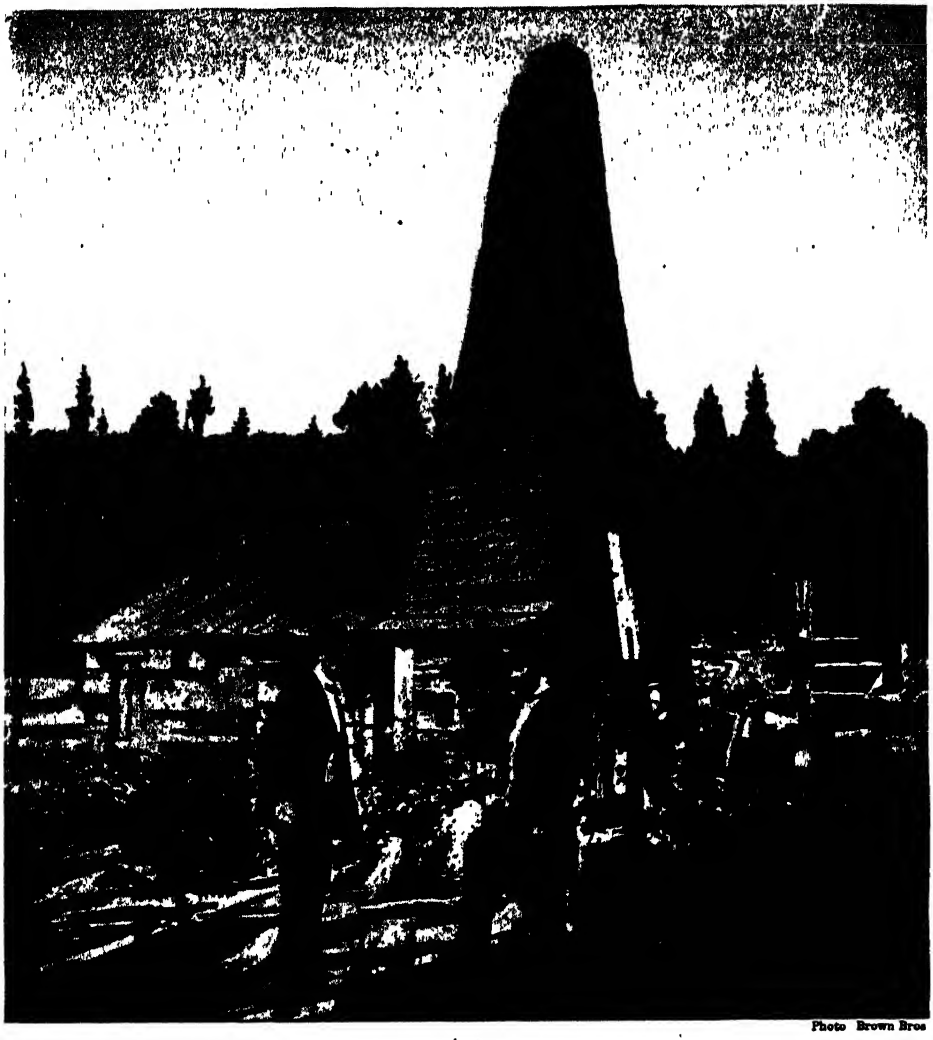


Photo Brown Bros

PENNSYLVANIA'S FIRST OIL WELL

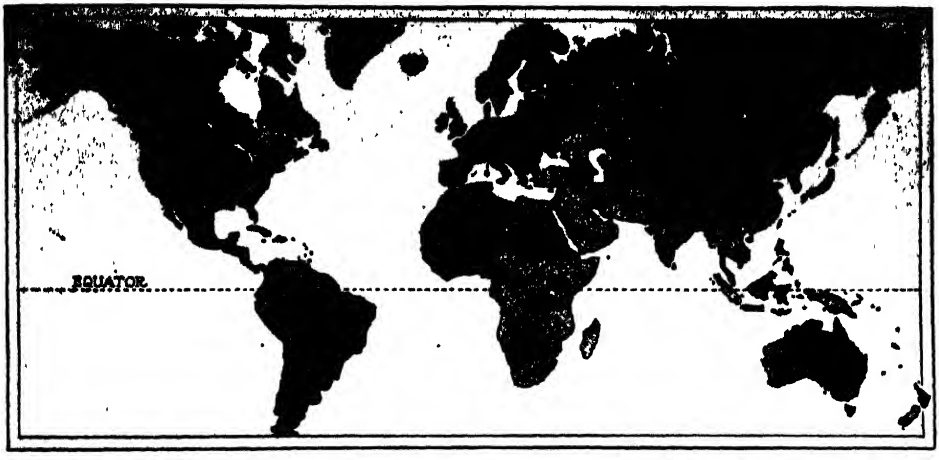
It is claimed that the well shown above was the first one drilled in the United States, but this is disputed. The well in Kentucky, referred to in the text, was not exploited for its economic benefits; the Pennsylvania well of 1859 was the first to be sunk for commercial purposes.

PETRIFIED FOREST. See ARIZONA (The Land and Rivers); COLORADO (Scenic Wonders); FOSSIL; MONUMENTS, NATIONAL.

PETROGRAD, *pet' ro grahd,* former capital of Russia, formerly Saint Petersburg, and in 1924 renamed Leningrad (which see).

PETROLEUM, *pe tro' le um.* When the Indians who inhabited what is now the western part of Pennsylvania first became known to white men, they were in the habit of collecting an oil which was found in springs and on the surface of creeks, and rubbing their bodies with it, claiming that the oil made them strong and enabled them to win races. Occasionally, they ignited small quantities in their religious ceremonies, for they held in the greatest awe this fluid which would burn, believing it to be associated in some way with an evil spirit. Later, white men, accepting the Indians' mistaken belief concerning the medical properties of this oil, bottled and sold it as a remedy for rheumatism. No one thought that it would in time be used to light and heat houses and provide power for the navies of the world, or that its most valuable product would some day run millions of gasoline motors.

Petroleum Long Known. Since almost before the dawn of history, petroleum has been known, and very early it was put to such uses as the intelligence of the ages could devise. Its



KNOWN OIL REGIONS OF THE WORLD

occurrence was noted in bituminous pools; it was seen as a dark scum on the surface of placid waters when Babylon and Nineveh were young; and was used in the cements employed in building Nineveh's walls, it is said. Herodotus recorded its presence in some of the Mediterranean islands. This typical product of the modern age was known to the ancient Egyptians, the Romans, and the Greeks; to the inhabitants of the cradle of civilization, in Western Asia; and to the American Indians, no one knows how far back in point of time.

Early settlers in Pennsylvania viewed manifestations of the presence of petroleum with disgust. In digging wells for water, they often encountered this substance, and the resulting flow of oil was drained into streams, to be carried into the rivers. Once the Cumberland River was set on fire to dispose of the oil floating on it, but this dangerous expedient was not repeated.

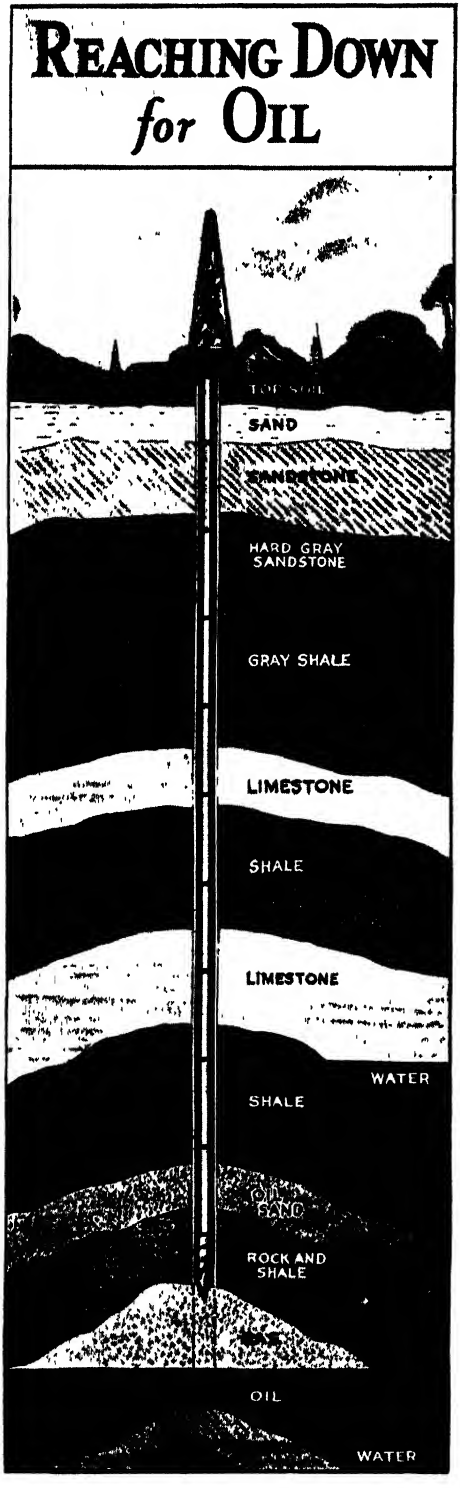
Its Growth in Importance. The first commercial oil well in America, the "Old American," was probably drilled about March, 1829, on Little Renox Creek, near Burkesville, Ky. The oil was sold as a "cure-all" for years, both in America and in Europe. The industry as we know it to-day dates from the discovery of an oil field near Titusville, Pa., in 1859. There was not much encouragement for men to capitalize it, for petroleum was not then known to have many uses.

Science soon discovered that, by refining petroleum, kerosene could be produced, and the kerosene age followed. Earlier, kerosene had been derived from coal, and that is the reason some people yet call it coal oil. Still earlier, oil from the head of the sperm whale had been the principal source of supply of lubricants, and the chief material for making tallow candles to furnish illumination for homes. Early attempts to light homes by the use of crude petroleum did not meet with success; the odor and smoke were offensive.

When science found a way to refine petroleum, kerosene was for many years its most valuable product. Gasoline was produced in the process of distillation, but there was no market for it. It is recorded that much gasoline was burned at night in order to get rid of it. Then came the invention of the internal-combustion engine, and the demand for gasoline expanded. To-day kerosene may be considered a by-product of the petroleum industry, and 800,000,000 barrels of gasoline products are insufficient to supply the world's yearly needs.

Politics and Petroleum. A few centuries ago, nations were carried to the verge of war in trying to wrest gold lands from their neighbors, or in striving to hold their yellow wealth from confiscation. Petroleum, the modern "black gold," is now of more value to the world than the most precious of metals, and diplomats are struggling to obtain advantage for their countries in far-away spots where there are rich petroleum deposits. Petroleum is now a vital factor in the progressive march of nations; the international oil problem, so far as it is political, is the problem of the "open door" as against national monopoly—whether the people of one country shall have equal rights with those of another country in oil fields, wherever they exist.

[Great Britain and France struggled to obtain sole concessions in the rich oil fields of Syria and Iraq, to be shared by both, but the United States demanded and secured for itself equal privileges Turkey resolutely refused to relinquish rights to participation in the same fields. Around the Caspian and Black Sea area are some of the world's richest fields; Russia has preserved these from outside exploitation. Mexico's recent political unrest, involving the United



States and Great Britain, except for its religious controversy has been almost wholly due to pressure to control vast oil interests in the Tampico fields. France and Great Britain have struggled for oil supremacy in Rumania. These represent a few of the controversial areas that have challenged the world's statesmanship.]

Distribution of Deposits. Every continent contains petroleum deposits, as do the large islands of Sumatra, Borneo, and Java, in the East Indies. The largest single oil well in the world is declared to be in Eastern Borneo; there the oil does not have to be pumped, for it flows through pipes from near the base of a mountain by gravity, direct to tank steamers, which carry it to all parts of the world. In known quantity, Africa and Australia have least oil; the Americas at present are producing yearly close to seventy per cent of the entire world supply, in the abundant fields of the United States and Venezuela Geologists do not expect this rich advantage to continue indefinitely, unless new deposits are discovered. It has been predicted that the American and Venezuelan fields may at any time drop from first and second positions through exhaustion of fields or lessened flows; predictions as to the time of exhaustion of the known supply in the two countries range from ten years to not more than twenty years, even if the rate of production were not increased. Men know that some of the most productive areas of but a few years ago are to-day valueless; they are therefore searching the world for favorable evidences of new fields which shall supply the world when present fields are pumped dry.

[In the map on page 5521 the known petroleum areas are graphically compared]

The Petroleum Industry

Nature of Petroleum and Locations. This "black gold" is an oil of animal or vegetable origin, a liquid of complex, organic chemical structure and varying color—ranging from black to brown and even amber. Its color depends upon the different hydrocarbons it contains, with such impurities as phosphorus, sulphur, nitrogen, and occasionally some other negligible substances. In its crude state, it is about four-fifths as heavy as water. It belongs chemically to the group of organic substances which we know as bitumens; these may be solids, liquids, or gases, and include petroleum, natural gas, asphalt, and the like.

Petroleum lies beneath the surface of the earth in basins, stored in sand, between layers of rock through which the oil cannot pass. It is reached by drilling. The depths at which it is found vary widely; the first oil well that started the industry in Pennsylvania was sunk only 69½ feet before the deposit was reached; in other fields, depths of 5,500 feet have been



Photos: Brown Bros.; Keystone

They Drilled for Oil, and Got It. At the right is the interior of a shed covering the drill (see illustration in this article, "Reaching Down for Oil"). At the left, the well later "came in" with powerful force, sending the oil high in the air.

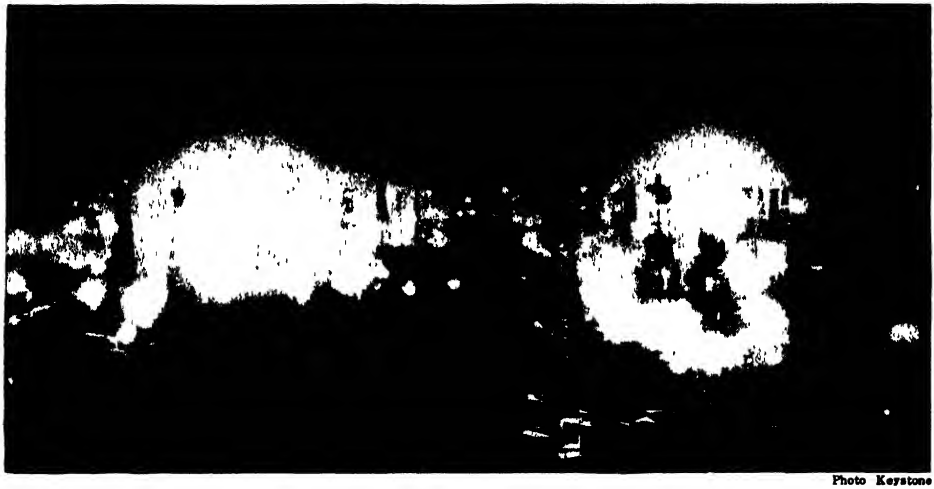


Photo Keystone

WORKERS KNOW NOT NIGHT NOR DAY

A view of the Santa Fe oil fields in Los Angeles County, Calif., brilliantly illuminated at night Work continues throughout the twenty-four hours of the day.

reached before the oil was found. Scientists are of the opinion that more powerful and more efficient machinery may some day locate petroleum at much greater depths, but there is no certainty as to this.

How Drilling Is Done. There are two methods commonly employed to pierce the crust of the earth to depths where lie the dark lakes of petroleum. The most familiar is the cable-tool, or percussion, method, comparatively slow and cumbersome. A steel bar forty to sixty feet long, with a sharp drill attached at the lower end, the whole often weighing 2,000 pounds, is attached to a cable which is run over a pulley. The heavy bars are alternately raised and lowered by machinery, the downward stroke being rapid; this stroke sends the drill lower and lower and gradually deepens the hole. To prevent water from flowing in, casings are sunk at the time of drilling, and these keep pace with the depth of the shaft.

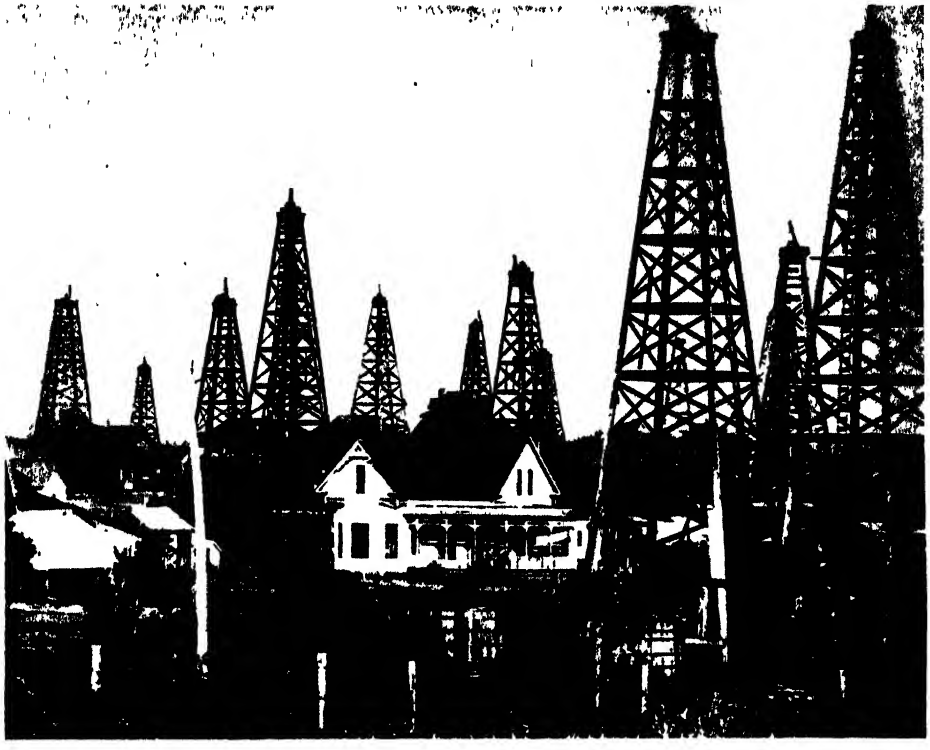
The more modern and much faster method is known as the hydraulic rotary system of drilling. A derrick, as in all methods of drilling, supports the machinery necessary to the operations. A rotary bit, which works in a manner similar to a carpenter's bit, eats its way through the rock in its descent. The bits of rock pulverized by the descending tool are washed upward and out of the shaft by a stream of water sent down under pressure. This waste matter is examined as it comes to the surface, and the operators are able to determine the nature of the substances through which they are drilling. An oily appearance denotes the near presence of petroleum. The hole or shaft made by the rotary drill is lined with iron pipe, and this iron tube, and the hole it surrounds, are really all there is to an oil well. All accessories at the surface of the ground are designed to pump oil from below when it does not ascend under pressure from the depths of the earth, and to provide temporary storage until the oil is sent to the refinery.

Less than a century ago, the exclamation "There she blows!" meant the discovery of a whale by whalers, and soon the acquisition of a few hundred more barrels of sperm oil to help light the world. Now the same phrase means that a new gushing oil well has been tapped, to produce light, heat, power, and wealth

Why Wells Are so Numerous. There are times when the mighty flow of oil from wells to refineries has exceeded the demand, yet at the same time, new wells are being drilled in great numbers. This constant drilling is essential for the protection of owners of oil lands.

Suppose that A has a tract of land which he believes is underlain with oil, but he has not sunk wells on his property. His neighbor B has an adjoining tract, on which he has wells, and from which he is pumping oil. No man can have a monopoly of oil which is beneath the ground he owns; if A does not wish to see B exhaust the oil deposit which is supposed to underlie his own claim, he must sink wells and begin pumping, in order to get his share of oil.

To conserve the oil supply, since it is not right or expedient to prohibit drilling, officials are of the opinion that conservation can best be practiced by ceasing to pump from any wells at stated periods, but no agreements have been reached to this effect.





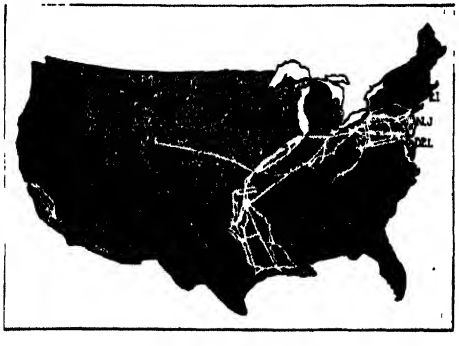
Photos: Brown Bros.

Views in Two Oil Fields. In a village in Oklahoma, the field encroaches upon the residence district; this is not an isolated case. Below is a view of wells in the Beaumont (Tex.) field.

Cost and Hazards of Drilling. Men acquainted with the oil industry are aware that more money is put into the ground in some sections than is ever taken out of it. From about 1910 to 1915, the average cost of drilling a well was from $3,000 to $5,000; in less than a dozen years, it had risen to as high as $40,000 in many fields. What is believed to be the high-water mark in cost of drilling was experienced in Southern California, where $350,000 was spent on one well at Santa Fe Springs, and a total loss resulted, for no oil was found. The average cost of drilling in some fields is now close to $100,000 for each well.

The general public has invested hundreds of millions of dollars in speculative oil enterprises. A few have been fortunate, but thousands of people have lost their money through ill-advised investment. Most of the known oil locations are controlled by companies whose officials are experienced men, but even the combination of capital and intelligence cannot assure success in any drilling enterprise.

Pipe Lines. Formerly, all crude oil obtained in the United States was refined near its source, or transported to refineries by rail in large cylindrical tanks the length of a flat car, but to-day over 60,000 miles of six-inch to ten-inch pipes, laid underground, carry much of it under pressure over half the way across the continent, to the great Eastern refineries. Twenty to forty miles apart, powerful pumps are placed, to drive the flow of oil onward. Petroleum which enters a pipe line in Texas, for example, will reach a refinery at the foot



PRINCIPAL PIPE LINES

of Lake Michigan (Whiting, Ind.), 970 miles, in 323 hours, and Bayonne, N. J., 1,700 miles, in 567 hours; from Eastern Wyoming to Whiting, 1,100 miles, in 367 hours, and to Bayonne, 1,830 miles, in 610 hours. In addition to the cross-continent pipe lines, each oil field is underlaid with a network of pipes called "gathering lines." The pipe lines are chiefly owned by large corporations, including the Standard Oil, the Sinclair Oil, the Texas Company, and many independent concerns.

The Process of Refining. In the form in which it comes from the ground, petroleum is known as crude oil—a term which indicates that it has not been refined; it is in its natural state. Crude oil contains a variety of substances, some more volatile than others; that is, they do not all boil and pass into vapor at the same temperature. Not many years ago, many of these substances were lost in the



OIL FIELDS OF THE UNITED STATES

(*a*) Appalachian
(*b*) Lima-Indiana
(*c*) Illinois
(*d*) Northwest Louisiana
(*e*) Gulf
(*f*) North Texas
(*g*) Mid-Continent
(*h*) Colorado
(*i*) Montana and Wyoming
(*j*) California

process of refining because no attempt was made to preserve them; but to-day, by what is known as fractional distillation, they are saved, and industry is benefited. Other methods are also employed, to which reference is made below.

In the process of refining by fractional distillation, the crude oil is placed in cylindrical steel tanks, some of which are large enough to hold 600 to 700 barrels Heat is applied—moderately at first; it drives out the lightest, most volatile substance, as a vapor, and this is condensed into liquid. A slight increase in heat releases the next lightest substance in the same manner, and it is liquefied. Each time the heat is increased a heavier substance is released, until all that is left of some oils is a sort of pitch, or asphalt. In the process of distillation, the crude fractions preserved are known commercially as follows (listed in order):

Cymogene, which boils at 32° F It is used as a refrigerant, and is gaseous except at low temperatures.

Rhigolene, which boils at 65° F., from which is manufactured a product used in medicine as an anesthetic.

Petroleum ether, the third product, boils at 40° to 70° F., and is used as a solvent and as a carbureting agent.

Gasoline, which boils at 70° to 90° F See GASOLINE, in these volumes.

Naphtha, reaching the boiling point at 80° to 110° F. See NAPHTHA.

Ligroine, whose boiling point is 80° to 110° F., is used as a solvent and as an illuminant.

Benzine, used as a solvent, has a boiling point between 120 and 150° F.

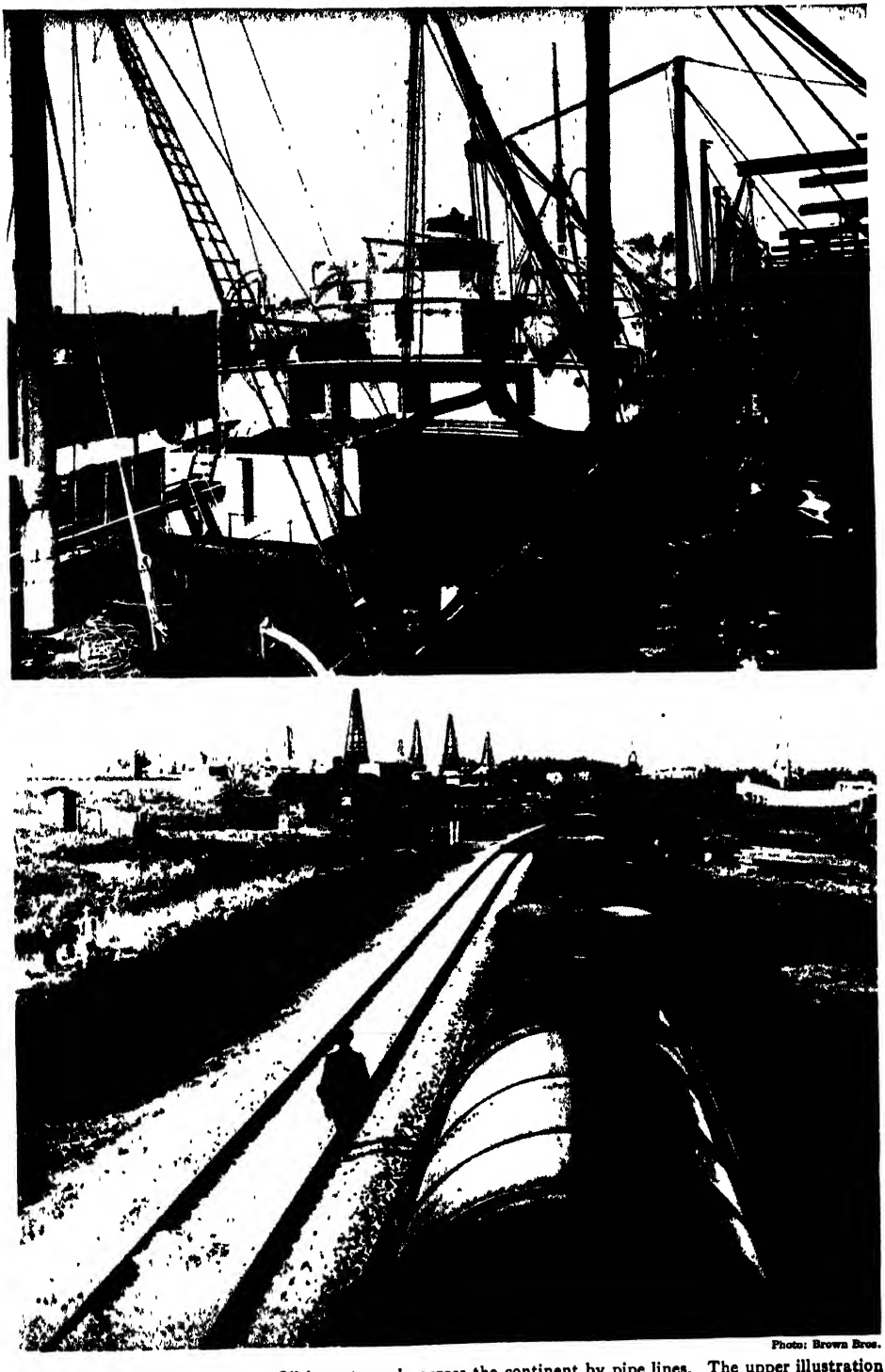


Photo: Brown Bros.

On the Way to the Consumer. Oil is sent nearly across the continent by pipe lines. The upper illustration shows a vessel being loaded with petroleum at Bayonne, N J, one of the pipe-line terminals in the East, for shipment by water. Below is a train of tank cars starting eastward from California.



Photo: U & U

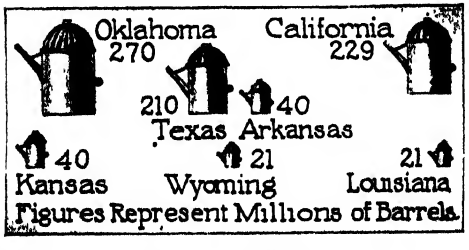
A Burning Oil Well. This fire in the Spindle Top field of Texas destroyed a hundred thousand dollars' worth of petroleum before it was extinguished.

5528

The foregoing products are all light and volatile; the next distillation produces kerosene (which see), once the only product which was thought to be commercially valuable. Beyond this point, the distillation renders various grades of light to heavy oils.

The "Cracking" Process. When the demand for gasoline grew to extraordinary lengths, chemists were called upon to devise methods by which a greater proportion of gasoline could be extracted from petroleum; in the "cracking" method, they recorded a high achievement. By it oil from which the lighter naphthas have been removed is subjected to tremendous pressure and very high temperatures, resulting in the breaking up, or cracking, of the organic molecules of the oily constituents. When the resulting gasoline is separated, the residue may still be subjected several more times to the same process, until a large proportion of the entire mass is converted into gasoline products. Had the cracking process not been developed, it would have been impossible for the supply of gasoline to keep pace with the demand.

Petroleum from Coal. German scientists have met with much success in originating a method of producing petroleum, though not



STATE PRODUCTION

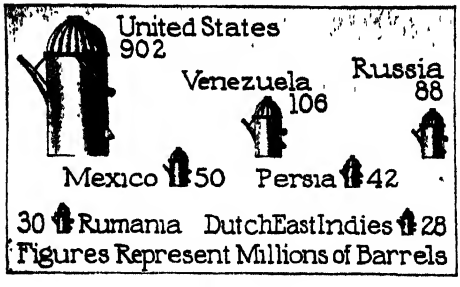
The figures in each instance represent the production of petroleum for an average of three years in the seven leading states.

from wells. Their laboratories have developed a method of turning coal into products resembling petroleum, and a production of 50,000,000 tons a year—possibly more—is hoped for. The German nation has no petroleum-producing fields, but has coal in abundance.

This new discovery is said to have come about through the manufacture of synthetic nitrates. The two processes are similar in technic, and can be operated in the same factory. The same reagent, hydrogen gas, is used; this, added to the nitrogen of air, produces ammonia, and, when added to the carbon compounds of coal, produces a petroleum. The hydrogen comes from water (composed of hydrogen and oxygen—H_2O). When steam is passed through coal, the carbon removes the oxygen, forms carbon monoxide, and sets free the hydrogen.

The first German factory constructed for these operations contains several very large generators, each sufficient to convert fifty carloads of coal—even as low in quality as brown coal, or lignite—into water gas for making ammonia or petroleum.

Great American oil corporations have already become interested in this important development; they are said to have purchased the



WORLD PRODUCTION

The figures represent average production per year for a period of three years

right to use the German methods of synthetic-petroleum production in the United States, a measure of insurance against the time when, as seems certain, the natural petroleum supply in the country will be greatly reduced and possibly exhausted. T.B J.

Related Subjects. The reader is referred in these volumes to the following articles

Benzine	Kerosene	Paraffin
Gasoline	Naphtha	Vaseline

PETROLEUM JELLY. See VASELINE.

PETROPAVLOVSK, *pyeh tro pahv' lohfsk,* capital of Kamchatka (which see).

PETUNIA, *pe tu' nih ah.* The petunias are among the most popular of garden flowers. The large bell-shaped blossoms, velvety of



Photo: Visual Education Service

PETUNIAS IN VASE

texture, are lovely to look upon, with their range of colors and crinkly petals. The species are native to South America, but are

widely grown in America and other countries, where florists have cultivated many hybrids, or mixed varieties. The leaves and stems are covered with long, white hairs, and the blossoms are pure white or varying shades of purple, violet, rose, and pink. Petunias are grown in plots and borders in gardens, in window boxes, and in conservatories. They thrive best in rich soil and in locations where they have plenty of sunshine. Some of the finest varieties are grown from cuttings, but varieties true to seed are now well established. B.M.D.

Scientific Names. The petunias constitute a genus in the nightshade family, *Solanaceae*. Most of the forms seen in the gardens are hybrids of *Petunia nyctaginiflora* and *P. violacea*.

PEWEE, *pe' we.* See PHOEBE; WOOD PEWEE.

PEWIT, *pe' wit.* See PHOEBE.

PEWTER, *pu' tur*, a metal alloy having tin as its principal constituent. The chief metals used in composition with the tin are copper, lead, antimony, and bismuth. The proportions of the ingredients vary, from seventy-five to ninety per cent of tin being combined with twenty-five to ten per cent of the other materials. As a rule, the larger the proportion of tin, the better the pewter. The finest pewter is made of tin and copper.

During the seventeenth and eighteenth centuries, pewter was widely used in England and continental Europe for domestic utensils, and to some extent for church vessels. It was introduced as a substitute for silver and gold, and many of the articles are obvious copies of the work of goldsmiths and silversmiths. After the eighteenth century, pewter was gradually replaced by china and glassware.

The finest examples of pewter are to be found in museums and private collections. There is much to interest collectors in the plates, candlesticks, pint pots, tankards, bowls, and jugs of an earlier day. However, this alloy does not belong exclusively to the field of the antiquarian. There are indications that pewter ware is coming back into fashion, and many attractive articles for table use may now be seen in modern stocks of tableware.

Considerable care is required to keep pewter in good condition. It tarnishes easily and needs frequent polishing. It is easily scratched and may be ruined by injudicious cleaning. Then, too, it is subject to dents and breakage, and it does not withstand a high degree of heat. However, with reasonable care, it can be kept in as good condition as silverware. T.B.J.

Literary Reference. It was of this alloy that Longfellow wrote in *Evangeline*:

> . . . the pewter plates on the dresser
> Caught and reflected the flame
> As shields of armies the sunshine.

PEYOTE, *pa yo' te.* See CACTUS.

PFENNIG, *pfen' ig*, a standard coin in Germany. See MONEY (Foreign Monetary Standards).

PHAEDRA, *fe' drah*, in Grecian myth, a daughter of Minos and sister of Ariadne. Though he had abandoned Ariadne, Theseus, in his old age, proposed for the hand of Phaedra and was accepted; but when the young bride came to Athens, she fell in love, not with Theseus, but with his young son, Hippolytus. When he spurned her advances, she accused him to his father of insulting her. The old king prayed to Neptune to punish his ungrateful son, and Neptune answered his prayer very promptly, drowning, with his waves, the young prince, who was at that time driving his chariot by the seashore. Phaedra, in a fit of remorse, hanged herself. Her story is the theme of Euripides' *Hippolytus* and Racine's *Phèdre*. See ARIADNE; THESEUS.

PHAETHON, *fa' e thon*, in Greek mythology, the son of Apollo and Clymene. Clymene had refused to tell her son who his father was until the boy, shamed by his companions, made an imperious demand When he learned that he was actually the child of the sun god, he boasted of it proudly, and was laughed at by his playmates. To prove his claim, he journeyed to the palace of the sun and asked of his father a sign of his sonship Apollo promised to grant any request he might make, but when Phaethon demanded that he be allowed to drive the chariot of the sun for one day, the father tried to retract his promise Phaethon persisted, however, and after cautioning him to drive slowly, and to take care to go neither too high nor too low, Apollo reluctantly watched him depart. The rash boy used the whip on his fiery steeds, which tore up the heavens, dragging the chariot after them. They went so high that the earth beneath them almost perished with cold; then they rushed down so close to the ground that vegetation was scorched, rivers were dried up, and rocks were split. The poor Earth called on Jupiter for help, and he hurled his thunderbolts at the boy, who fell from the chariot and was killed.

Related Subjects. The story of Phaethon is given in satisfying completeness in the article MYTHOLOGY See, also, APOLLO; and AURIGA, for connection with astronomy.

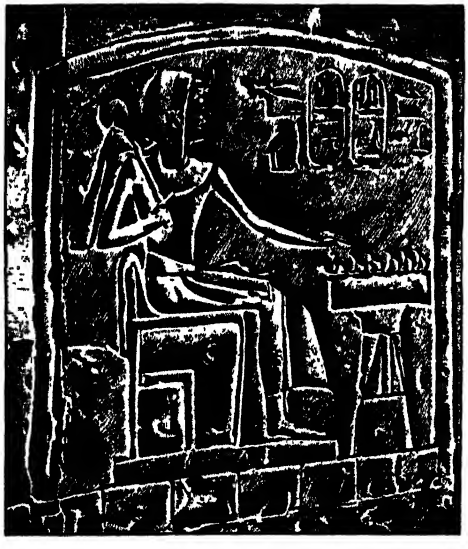
PHALANGES, *fah lan' jeez.* See HAND, illustration; also FOOT.

PHALANX, *fa' langks*, the order of battle in which the ancient Greek infantry was formed. The legions of Rome afterward adopted the same formation and proved invincible. The phalanx was sometimes a triangular-shaped wedge which was driven through the enemy's ranks; sometimes it was a solid square which resisted all attacks, but was not so mobile as the wedge. In a square it consisted of eight to

sixteen ranks, the men being armed with spears from eight to fourteen feet in length, and protected by shields which covered nearly the whole of their bodies.

PHANEROGAMOUS, *fan ur og' ah mus,* **PLANTS,** OR **PHANEROGAMS,** *fan' ur o-gamz,* names applied by earlier botanists to that division of the plant kingdom which is made up of flowering plants. The distinguishing characteristics of phanerogamous plants are that they possess flowers with stamens, and ovules that develop into seeds with embryos. Plants that reproduce by spores were called *cryptogams* by the earlier botanists. Though the terms are not scientifically accurate, they are retained for convenience. See CRYPTOGAMS. B.M.D.

PHARAOH, *fa' ro,* or *fa' ra o,* the Biblical title of the kings of Egypt, ten of whom are mentioned in the Old Testament. The Pha-



MERENPTHAH

Long believed to be the Pharaoh mentioned in *Exodus* He is pictured playing draughts.

raohs of the times of Abraham and Joseph were probably of the Hyksos line, and, being themselves Semites and shepherds, were friendly to the wandering Hebrews. The Pharaoh of the Oppression, "the new king that knew not Joseph," was long identified with Rameses II, a builder of great cities, on which he employed Israelite labor (*Exodus* I), and the Pharaoh of the Exodus was supposed to have been Merenpthah, son of Rameses II. Recovered inscriptions, however, prove that these suppositions are incorrect. Among others mentioned are the Pharaoh who was the father-in-law of Solomon, the Pharaoh who was the opponent of Sennacherib at the time of Hezekiah, and Pharaoh Necho, who invaded Palestine and was overthrown by Nebuchadnezzar. See MOSES.

PHARAOH'S RAT. See ICHNEUMON.

PHARISEES, *fair' ih seez,* the strongest of the religious sects in Judea at the time of Christ. The Pharisees held themselves apart, not only from the heathen but from the other Jews as well, and were commonly considered to have reached a state of piety to which ordinary men could not attain. To the written law of the Pentateuch they added the oral law, supposed to complete and explain the original statutes. It made rules for the minutest details of daily life, such as eating, drinking, and washing of hands, and for tithing, fasting, and Sabbath observance, till it put upon the whole people "burdens too grievous to be borne." Jesus accused the Pharisees of making the Word of no effect by their traditions, and spoke His severest words in denunciation of their hypocrisy (*Matthew* XXIII). Besides subscribing to the oral law, the Pharisees believed in the resurrection of the dead and an elaborate doctrine of angels and spirits. In all of these teachings they were bitterly opposed by their rival sect, the Sadducees.

After the Christian Church had organized itself independently of Judaism, the Pharisees withdrew themselves more than ever from the world. The Talmud, still recognized as authority by Jews of all nations, was the painstaking work of Pharisees during the early Christian centuries. There were numbered among the Pharisees many men of sincere piety and great learning. Gamaliel and his pupil Saul (Saint Paul) were of this sect.

Related Subjects. The reader is referred in these volumes to the following articles

Paul (Apostle)	Sadducees
Pentateuch	Talmud

PHARMACIST, *fahr' mah sist.* See DRUGGIST.

PHARMACOLOGY, *fahr mah kol' o jie,* or the study of what drugs do, is one of the most recent sciences, but is closely concerned with one of the oldest of human efforts, the giving of remedies for the relief of disease. In the attempt to ease pain or get rid of sickness, men have been willing to try anything, from swallowing all sorts of abominations, or being "vomited, purged, and bled" (eighteenth century), to incantation. In this long process of trial and error, certain plants, such as poppy, belladonna, foxglove, and others, as well as some minerals, as Epsom salts, soda, or Glauber's salt, were found to produce certain desired results. Pharmacology began during the nineteenth century with the rise of chemistry, when these various crude plant and mineral materials which act on living tissue could be analyzed, the active part isolated in pure form, its composition determined, and

its precise effect, when given to an animal under controlled conditions, accurately measured.

Thus pharmacology is dependent on chemistry and biology, being the study of the action of chemicals on living things, whether plant or animal, and whether the action is beneficial or harmful. The branch of pharmacology relating to poison is *toxicology*. Nearly all chemical agents in large enough amounts are harmful to living tissue. *Pharmacy* is concerned with dispensing drugs to the sick.

The chief application of pharmacology is to medical treatment. When a physician knows exactly how chemicals in certain doses will act on living tissue, he may use them for the following purposes:

(1) *To cure disease*, by removing the specific causative agent, as when mercury is used to combat syphilis, or quinine against the parasites causing malaria, or carbon tetrachloride against hookworm, or others;

(2) *To relieve a diseased condition*, as digitalis in certain heart diseases, insulin in diabetes mellitus, liver extract in pernicious anaemia, ephedrine in asthma, and so on;

(3) *To diagnose diseased conditions*, as the halogenated phthalein dyes, barium salts, or iodized oils in X-ray examination of the body cavities;

(4) *To prevent disease*, as various antiseptics for skin and instrument sterilization in surgery, or iodine compounds to prevent simple goiter, or cod-liver oil to prevent rickets in infants.

By investigations of the relation of chemical constitution to pharmacological action, important new chemicals have been produced which more nearly approximate the ideal of high therapeutic efficiency with low toxicity than do those from natural sources. This sort of study was greatly advanced by Paul Ehrlich (1854-1916), who introduced organic arsenicals for the treatment of syphilis, and the study has now been extended to local anesthetics, hypnotics, various types of antiseptics, and the coal-tar derivatives employed to lessen pain (analgesics). C.D.L.

PHARMACOPOEIA, *fahr mah ko pe' yah*, a book containing tables of drugs, a statement of their properties, action, and use, the doses in which they may be taken, and the standard of strength and purity. The volume is compiled usually under highest professional, sometimes governmental, authority, by men who have wide knowledge of the subject. The first book of the kind was the *Nuremberg Pharmacopoeia*, published in Germany in 1542. From time to time, similar books were published, but they varied in accuracy and worth, and so the necessity of standardizing such publications became apparent. The governments of practically all civilized nations now authorize the preparation of national pharmacopoeias, which are continually revised.

The first pharmacopoeia published in the United States appeared in 1778, and was designed for use in the army. The earliest which was national in scope dates from 1820, the year of the assembling of the first convention of delegates of medical colleges and societies. Similar conventions have since been held every ten years, to provide for new editions of the work. In 1907, under the provisions of the Food and Drug Act, the pharmacopoeia of the United States was made a legal standard, and the tenth revised edition was published in 1925. Laws of Congress make provisions for the enforcement of the requirements of the work.

PHARMACY, *fahr' mah sie.* See DRUGGIST; MEDICINE AND DRUGS; PHARMACOLOGY.

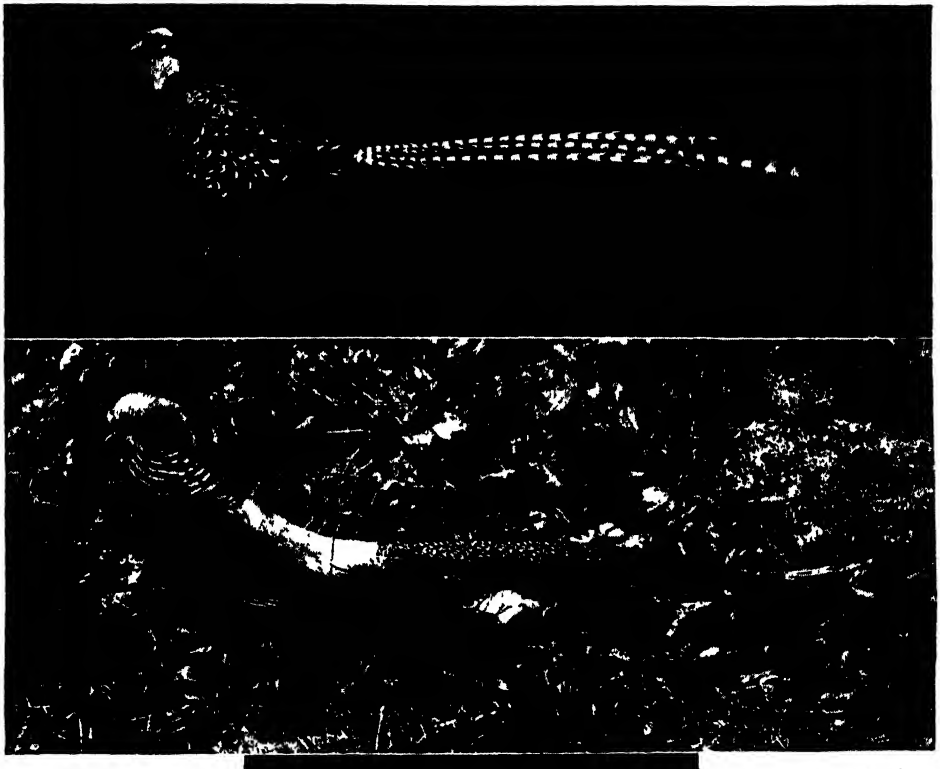
PHAROS, *fa' rohs*, a rocky island off the African coast, formerly celebrated as the site of the first lighthouse, erected by Ptolemy II (308-247 B.C.), and long regarded as one of the seven wonders of the world. When the city of Alexandria was founded by Alexander, he caused the island to be connected with the mainland by a mole, or causeway, seven furlongs (280 rods) in length. The great lighthouse, over 400 feet high and resting on a base 100 feet square, stood for nearly 1,600 years; it was destroyed by an earthquake in the fourteenth century. The peninsula is now occupied by part of the modern city of Alexandria.

Related Subjects. An illustration showing the relative location of Pharos and the mainland appears in the article ALEXANDRIA See, also, SEVEN WONDERS OF THE ANCIENT WORLD, LIGHTHOUSE

PHARSALIA, *fahr sa' lih ah*, BATTLE OF. See ANTONY, MARK; POMPEY.

PHARYNX, *fair' inks*, the name given to the short, tubelike recess just back of the mouth. It forms the connecting link between the mouth and the oesophagus, and also between the back of the nose and the larynx. The nasal passages open from above into the pharynx. This part is called the *naso-pharynx*, and it leads directly into the upper part of the larynx.

The opening into the larynx is guarded by a flap of tissue called the *epiglottis*. The opening of the nasal passages into the pharynx is guarded by another flap of tissue called the *uvula*. This can be seen hanging down centrally in the back part of the mouth when the mouth is opened wide and the tongue protruded. By means of these two flaps of tissue, then, the respiratory openings into the pharynx may be entirely shut off, and this is what happens when the pharynx is being used for the passage of food. Nature has provided but one common passageway at this point for air and for food, but has tried to keep us out of trouble by arranging for the passage to be used for only one thing at a time. Sometimes, however, when we are laughing or taking a deep breath just when we are trying to eat, the guards to





THREE MEMBERS OF THE FAMILY
At top, Reeve's pheasant; center, golden pheasant; below, ringneck pheasants.

the respiratory passageway do not work quickly enough, and we get food into our windpipe, which makes us choke. Normally, when we take food into the mouth, the act of swallowing causes the uvula to be pressed up and back against the pharyngeal wall, and the epiglottis closes over the larynx so that there is no opening for the food except that leading into the oesophagus. This opening is just behind that leading into the larynx.

There are muscles in the pharyngeal wall which alternately contract and relax and help to urge the food on toward the oesophagus. The average length of the pharynx is about five inches. The Eustachian tubes open into the pharynx, thus connecting it with the middle ear. K.A.E.

[Inflammation of the pharynx is called *pharyngitis* It is treated by recourse to the usual remedies for sore throat.]

Related Subjects. The reader will find collateral information under the following headings:

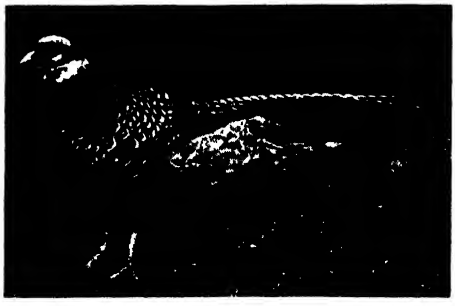
Ear	Mouth
Larynx	Nose
Membranes	Palate

PHASES, *fa' zez,* **OF THE MOON.** See MOON. Articles somewhat related to this subject are ASTRONOMY; ECLIPSE.

PHEASANT, *fez' ant,* one of a group of brilliantly colored birds belonging to the same family as the domestic fowl and the peacock. The word pheasant is derived from *Phasis,* the name of a river in Colchis, on the eastern shore of the Black Sea. In this region pheasants have always been found in large numbers.

Two of the best-known species are the so-called *English pheasant,* brought to England supposedly by the Romans; and the *ringneck.* These birds are natives of Asia Minor and of China, respectively. The English pheasant is bred in large numbers in English preserves as a game bird. The cocks of this species are most brilliantly colored, the head and neck being a bright green, the under parts bronze-red, and the flanks reddish-brown tipped with

blue-black; the long, tapering tail is gray, marked with bands of black. In different lights, the plumage reflects varying shades of black, green, purple, and gold. Female birds are of a yellowish-brown color, with markings



KING PHEASANT

of a darker brown. The cocks are about three feet long, fully half of this length being taken up by the tail, and the females are about a foot shorter. Ringneck pheasants have as a distinctive marking a white ring about the neck, but their plumage shows a similar brilliant combination of red, purple, green, and black. These two species have been crossed until pure-bred specimens have become rare.

The common hybrid of these two species is known in England as the *English ringneck pheasant*. It has been imported into America, and is there known as the *ringneck pheasant*. The bird was introduced by sportsmen to take the place of the prairie chickens that had disappeared from much of their former range. Pheasants thrive much better than prairie chickens in a settled farming country. They are hardy in all the prairie states, and in the Dakotas and Minnesota have multiplied so rapidly that they have become important game birds. The male is a bird of brown, red, golden, buff, blue, and black plumage, with usually a white ring around the neck. The female is less brightly colored and smaller. Pheasants nest on the ground, laying the ten or more olive-buff eggs in a hollow among the leaves. Berries, seeds, worms, and insects form their food. In some localities they have become so numerous as to be a menace to grainfields, but, on the other hand, their insect-eating habits are beneficial. Generally speaking, the birds need control in some places, and protection in others. State game farms have been established in many sections, and pheasants are also bred on private estates.

Among other well-known species are the *golden pheasant*, so called from its golden-yellow crest and bright-yellow breast; the *Chinese silver pheasant*, a beautiful bird whose white upper parts are delicately marked with black lines; and the *eared pheasant* of Central and Eastern Asia, whose name refers to the long white tufts of feathers growing out from the ears. Representatives of these and many other species may usually be seen in American zoological gardens. See GROUSE. D.L.

Scientific Names. Pheasants belong to the family *Phasianidae*. The English pheasant is *Phasianus colchicus*; the Chinese ringneck, *P. torquatus*.

PHEIDIPPEDES, *fe dip' eh deez*, the hero of Marathon (which see).

PHELPS, *felps*, ELIZABETH STUART. See WARD, ELIZABETH STUART PHELPS.

PHELPS STOKES FUND. See EDUCATIONAL FOUNDATIONS (Other Benefactions).

PHENACETIN, *fe nas' e tin*, a headache and fever remedy belonging to the coal-tar group, in which are included antipyrine and acetanilid. All of these medicines have similar effects, but phenacetin is the least depressing of the three. It should never be taken, however, except on the advice of a physician. Overdoses of phenacetin and similar preparations cause excessive lowering of the temperature, coldness of hands and feet, and a depressing effect on the heart. See HEADACHE; ACETANILID; ANTIPYRINE.

PHENIC, *fe' nik*, ACID. See CARBOLIC ACID.

PHENOL, *fe' nole*. See CARBOLIC ACID; DISINFECTANTS.

PHI BETA KAPPA, *fi be' tah kap' ah*, or *fe ba' tah kah' pah*, the oldest of the Greek-letter college fraternities. It was founded December 5, 1776, at William and Mary College in Williamsburg, Va., and now has about one hundred chapters in as many colleges, and a membership of no less than 40,000. In 1926 the sesqui-centennial of the organization was celebrated at Williamsburg, and a memorial auditorium dedicated.



THE EMBLEM

The specific aims of the society, together with its motto, were kept secret at first, but its general purpose was known to be the promotion of scholarship and of patriotism. Gradually it lost its secret character, as well as its social side, and became what it is to-day—an honorary society, membership in which is usually conferred by vote of the faculty upon senior or junior students who have stood best in scholarship throughout their college course. Occasionally, membership is conferred on graduates who have won distinction in careers after leaving college. Women as well as men may be honored by election. The letters Φ B K are the initials of the Greek words *Philosophia Biou Kubernetes* (Philosophy the

Guide of Life), and the badge is a small gold watch key. See FRATERNITY.

Sigma Xi, organized 110 years later as an honorary society for students of science, more nearly resembles Phi Beta Kappa in its scholastic requirements than does any other of the now numerous honorary fraternities.

PHIDIAS, *fid' ih as* (about 500–about 432 B.C.), the greatest sculptor of ancient Greece. From descriptions of ancient writers, we know that his statues and sculptures have never been surpassed in majesty, dignity, and beauty. Phidias was born in Attica, and is said to have started his career as a painter. However, he soon turned his attention to sculpture, reaching the highest development in his career under the patronage of Pericles, who commissioned him to execute many of the finest statues to be erected in Athens, and to superintend the public works of the city. Foremost among his colossal statues in ivory and gold were the celebrated *Zeus* at Olympia, one of the seven wonders of the world; and the *Athena* of the Parthenon at Athens. The sculptures of the Parthenon are thought to have been copies of his original designs. His most famous bronze works were the *Athena* on the Acropolis at Athens, noted for its size, and the Lemnian *Athena*. Phidias, accused of impiety in having wrought his own likeness and that of Pericles on the shield of one of his goddesses, and of theft in appropriating some of the gold destined for her robes, was thrown into prison. There are conflicting stories as to how he met his death.

Related Subjects. The reader is referred in these volumes to the following articles

Parthenon
Pericles
Sculpture (Greece)
Seven Wonders of the Ancient World

PHILADELPHIA, a name common to numerous cities of old Macedonia, applied in honor of several rulers called Philadelphus



Liberty Bell | Independence Hall | Betsy Ross Flag

PHILADELPHIA. This, the largest city in Pennsylvania, was founded in 1682 by William Penn and given its name, which means *city of brotherly love*, by that gentle Quaker, who applied in his colonial enterprise the principle of the Golden Rule. To this day, Philadelphia is called the *City of Brotherly Love*, and the title seems well deserved when one considers its relatively large number of churches and charitable and benevolent organizations. It would be misleading, however, not to emphasize another aspect of this great municipality, which is third largest in the United States, sixth in the world, and second in size and influence only to New York, in the territory east of the Ohio River. It is one of the world's busiest industrial cities, a center of printing and publishing, and a commercial port of first rank. It is also in the forefront with those American communities that are developing the "city-beautiful" idea according to well-defined plans, adequately financed. Finally, Philadelphia is inseparably connected with the events and personalities that brought about the establishment of the American nation, and no symbols of material progress are cherished with greater pride than the old landmarks associated with the Revolution and the Constitution.

Briefly Stated. Below are summarized a few of the notable statistical facts relating to Philadelphia. In some cases the figures must be regarded as approximations, since they are subject to slight changes from year to year.

Area, 129 7 square miles.
Banks, national, 30.
Banks, trust and savings, 96.
Bathhouses, public, 31.
Buildings, over 473,900.
Business places, over 67,200
Capital invested in manufacturing, $1,026,681,700
Churches, over 1,000.
Civic and social agencies, 686
Customs receipts, annual, about $50,000,000.
Day nurseries, 43.
Dwellings, 422,000.
Fire-engine companies, 69.

Homes, owned, over 156,350
Hospitals and dispensaries, 112.
Library buildings (main and branch buildings of the Free Library), 32.
Parks and park areas, 6,436 acres.
Police force, officers and men, over 5,000.
Postoffice employees, 5,000
Postoffice stations, 48.
Public schools, over 240
Pupils in day schools, about 268,000.
Recreation centers, 43.
Retail stores, 44,100.
Streets, paved (aside from boulevards), 1,368 miles.
Teachers in public schools, over 8,000.
Theaters with over 1,100 seats, 28.
Voters, registered, over 523,000.
Wage earners, 819,000.

The People. In the early years of the city, English Quakers and Germans were dominant elements in the population, which increased from about 2,600 to about 35,000 between 1684 and the outbreak of the Revolution. Immigration, especially after 1850, added greatly to the growth of population, and when the War of Secession began, Philadelphia was a city of over 565,500 inhabitants. In 1910 the census reported a population of 1,549,008; in 1920, 1,823,779. In 1928 the Census Bureau estimated it to be 2,064,200. About sixty per cent of the white population is of foreign parentage, the most numerous groups of European extraction being the Irish, Germans, Russians, English, and Italians.

The city proper, together with an extensive area outside the municipal limits, including Delaware and nine counties of Southern New Jersey, is designated as the Philadelphia Metropolitan Area. Close to a million people live in the area outside the municipality, and large numbers of them have business and other interests in Philadelphia.

Location and Size. The site chosen for the "City of Brotherly Love" was at the junction of the Delaware and Schuylkill rivers, ninety miles from the Atlantic Ocean and half as far from the mouth of the Delaware, or the head of Delaware Bay. It was Penn's intention that the city should be built along the banks of both rivers in an area about two miles wide, and that growth should be back from each river. For generations, however, the Delaware site on the east was preferred, and the entire area between the streams was not occupied until the middle of the nineteenth century. In 1854, by special act of the Pennsylvania legislature, the city was made coextensive with Philadelphia County, and its area increased to 129.7 square miles.

Philadelphia is ninety miles southwest of New York City, 136 miles from Washington, and 825 miles from Chicago. It has hourly train service with New York. The city is slightly south of the 40th parallel, and is therefore almost directly east of Columbus, Indianapolis, and Denver. It is served by three great railroad systems—the Pennsylvania, the Baltimore & Ohio, and the Philadelphia & Reading—which give it direct rail communication with all parts of the country and easy accessibility to the great iron and coal mines of Pennsylvania.

General Description. For twenty miles Philadelphia's irregular boundary line follows the curving shore of the Delaware, which separates the city from New Jersey. From the junction of that river with the Schuylkill on the south, at League Island, the city extends west to Cobb's and Darby creeks, the latter forming several miles of the western boundary. In the extreme northwest, the Schuylkill is the western border of one of two northerly extensions of the city, while Poquessing Creek marks the eastern boundary of the other arm, on the extreme northeast.

In the south the water front is below tide level, and is guarded by strong dikes, but the business section is forty feet above the sea, and in the northwest, hills rise to heights of over 400 feet in a culmination of the gradual ascent of the land westward from the Delaware. Picturesque Wissahickon Creek gives added charm to this region, which contains Chestnut Hill, Germantown, and other communities notable for their fine suburban homesites.

The business section is mainly concentrated on the neck of land between the two rivers, and is traversed by two main thoroughfares—Market Street, 100 feet wide, extending west from the Delaware to the city limits, a distance of about six miles; and Broad Street, 113 feet wide, crossing Market at City Hall Square about four miles north and nearly eight miles south of the opposite city boundaries.

Broad Street and the thoroughfares parallel with it are designated as "north" and "south" above and below Market. The majority of these north-and-south streets are numbered; those running parallel with Market, with a few exceptions, bear names. While the plan of having streets cross at right angles is generally followed throughout the city, there are several diagonal highways, especially in the outlying sections. Some of these are spacious boulevards (see below, *Boulevards*).

The section along the Delaware north and south of Market Street is occupied by wholesale houses and shipping interests. The Market Street district between Third and Fifteenth, particularly along Market, Walnut, Chestnut, and Arch, and the intersecting streets, is a retail, financial, and office center. The manufacturing interests, however, are widely distributed.

A few blocks southwest of City Hall is the Rittenhouse Square district, reminiscent of the old aristocracy of Philadelphia, and still



Photo Keystone

IN THE HEART OF THE CITY

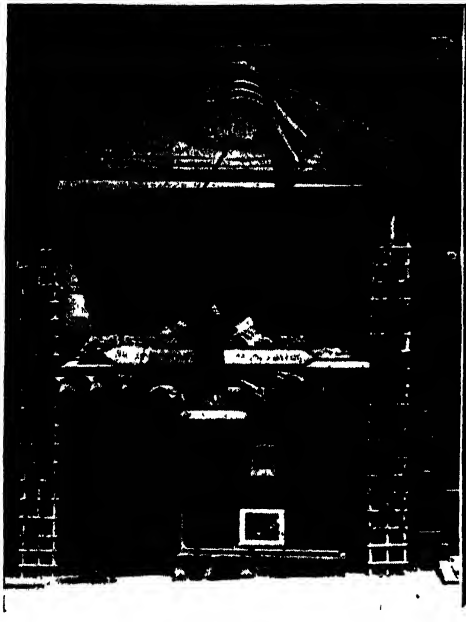
retaining an aspect of dignified exclusiveness. In general, the residential streets in the downtown area are giving way to the demands of business. No city has more delightful suburban sections than Philadelphia, both within and without the county limits, and it is more truly a city of homes than any other American community of comparable size.

Government and Business Structures. City Hall, one of the largest buildings in the world, and a good example of modern French Renaissance architecture, dominates the scene in downtown Philadelphia, with its graceful tower rising nearly 548 feet above the street level. The tower is surmounted by a thirty-seven-foot statue of William Penn, in Quaker garb. Facing City Hall on Juniper, at the southeast corner of Juniper and Filbert, is City Hall Annex, a fifteen-story office building, the first unit of a contemplated Municipal Building to occupy the area bounded by Market, Filbert, Juniper, and Thirteenth. Other buildings in the business district include the Widener, Wanamaker's, the Girard Trust, modeled after the Parthenon, the Bankers Trust, the Equitable, the Packard, and the thirty-story Fidelity Mutual Life Insurance.

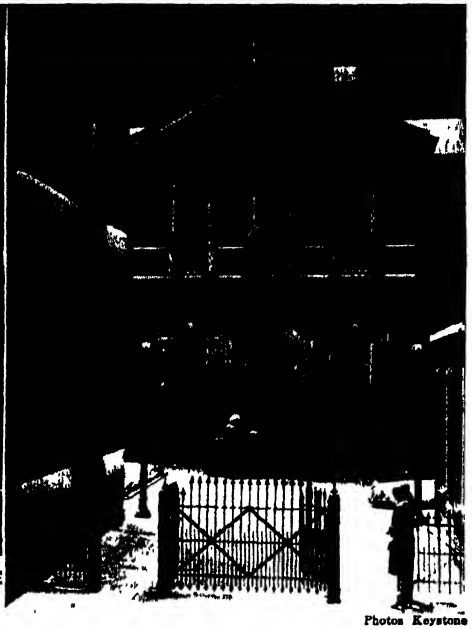
The main postoffice is housed in the Federal Building, an imposing granite structure on Ninth Street, reaching from Market to Chestnut. The United States Mint, another granite edifice, is located on Sixteenth and Spring Garden streets. It is the largest mint in the United States and one of the largest in the world (see illustration under MINT). The United States Custom House, a fine adaptation of Greek classic architecture, is located on Chestnut Street below Fifth.

Historic Buildings. No other city except Boston contains so many buildings of sentimental interest to Americans. Much of the political life of the colonies centered in Philadelphia, and it was virtually the capital of the country during the Revolutionary period. The buildings which sheltered the Congress and in which many historic incidents occurred are reverently preserved.

Independence Hall. This is the oldest of four buildings still standing on Independence Square, a cherished area in the heart of the city, fronting on Chestnut between Fifth and Sixth. The representatives of Pennsylvania colony in 1729 determined no longer to hold their legislative sessions in private houses, and they appropriated £2,000 ($10,000) for the purchase of grounds and the erection of a building for the General Assembly. (The manuscript of the act providing the appropriation still exists.) In 1734 the main building was completed, but it was without the bell tower until 1751. Plans were drawn also for



BETSY ROSS HOUSE



CARPENTERS' HALL

Photos Keystone

a building at either end of the main building; those were finished in 1785, after the war had ended, and were used as a city hall and a courthouse. In 1828 an appropriation of $12,000 was made for a new steeple. The story of the Liberty Bell is given under that title

On May 10, 1775, in the east room, unimposing in appearance, yet the most historic spot in America, the patriots met who formed the Second Continental Congress In the same room, on June 15, 1775, Washington was chosen commander in chief of the Continental army. Here, too, on July 4, 1776, the Declaration of Independence was signed. The American officers taken by the British in the battles of Brandywine and Germantown in September and October, 1777, were kept in this same east room, as prisoners of war On July 9, 1778, the Articles of Confederation (which see) were signed here by representatives of eight states. Independence Hall also sheltered the convention that adopted the United States Constitution The east room is shown in the halftone illustration herewith.

For more than a century, Independence Hall was used for public meetings of all descriptions To-day it is a museum laden with memories of the momentous days of the past. The Liberty Bell is in the main entrance; the Congress room, with desks of officers of the Continental Congress, and fourteen of the original chairs of members, is open to visitors; across the hall is another room of equal size, given exclusively to a display of relics of the Revolutionary period. The second floor, one long room, was for many years Philadelphia's public banquet hall. It is now a bare reminder of past glories

Congress Hall. Close to Independence Hall, on the southeast corner of Sixth and Chestnut, stands Congress Hall, now a museum of Revolutionary days. It was completed in 1790 on the former site of a wooden shelter provided for visiting Indians. From 1790 to 1800, it was the meeting place of the Congress of the new nation In 1793 Washington was inaugurated here for his second Presidential term, with John Adams as Vice-President; four years later, in the same room, Adams and Jefferson took the oath of office as President and Vice-President It was here that John Marshall, later Chief Justice of the United States, in announcing the death of Washington in 1799, uttered the phrase (taken from Henry Lee's formal resolution) which was destined to be inseparably linked with Washington—"first in war, first in peace, and first in the hearts of his countrymen."

After 1800 Congress sat in the new city of Washington, and the Hall became a court room.

Carpenters' Hall. Not far from Independence Hall, in a narrow court off Chestnut Street, between Third and Fourth streets, is another building famous in Revolutionary annals— Carpenters' Hall This building was planned in 1724, but was not begun until 1770 The First Continental Congress met here September 5, 1774 Building operations were not completed at the time; the structure was finished in 1792. From 1791 to 1797, the Hall was the home of the first United States Bank In point of fame, Carpenters' Hall is perhaps second only to Independence Hall.

The Betsy Ross House. At 239 Arch Street stands the home of Betsy Ross, with whose name is associated the designing of the first American flag. There are two rooms on the small ground floor. The first is now a salesroom of Ross memorials; the smaller rear room is bare, but is full of memories. Around the old fireplace in the corner, the story runs, George Washington and Robert Morris often sat with Mrs Ross, planning the flag which should represent the new republic. There is more or less tradition connected with part of the story, but the visitor who steps into the little room can imagine the courtly, patriotic group that gathered in the home of the





The Cradle of Liberty. Below is an illustration of Independence Hall. Congress Hall, above, is on the first floor, at the right; the original desks and chairs are in the same positions as in 1776.

pleasant-voiced, kindly widow. The Betsy Ross flag is illustrated in the article FLAG.

Penn Mansion. The home in which William Penn, the founder of Pennsylvania, lived with his family, was built in 1682. It was the first brick house erected in Philadelphia, and was on the street which later became Letitia Court, between Market and Chestnut streets, near the Delaware River. The encroachment of business houses threatened its destruction, so it was carefully taken down and brick by brick re-erected in Fairmount Park. The rooms contain Penn relics.

Other Old Buildings. Christ Church, on Second Street, near Market, was building from 1727 to 1744. Benjamin Franklin was one of the managers of a lottery in 1753 which was conducted to raise money for the steeple and for a bell. The old pulpit, put in place in 1770, is still in its original position. In the church graveyard at Fifth and Arch streets are the tombs of Benjamin Franklin and Robert Morris.

Old Swedes' Church was completed in 1700. It was the church home of the Swedish Lutherans, and for 130 years was served by pastors sent from Sweden. The present communion service has been used since 1773. The church is in the heart of the business district, on Swanson near Second.

Saint Peter's Church also antedates the Revolutionary period, for it was completed in 1761, fourteen years before Paul Revere summoned the slumbering New England farmers to arms from Boston to Lexington. Commodore Decatur's grave is in the churchyard. The church is still used for services.

Railway Terminals. Ambitious plans for the improvement of their terminal facilities have been put into operation or announced by all three of the railroads entering Philadelphia. For many years the Pennsylvania has maintained its Broad Street Station, flanking City Hall on the west, and the Reading has used a terminal two blocks east. The station of the Baltimore & Ohio, at Chestnut Street on the east bank of the Schuylkill, has underground connection with the Reading station. The following construction is under way or planned:

Pennsylvania Undertaking. On this project work was begun in July, 1927, with the erection of a railroad station, of spacious dimensions and ornate design, in West Philadelphia between Arch and Market streets, east of the present line of Thirtieth Street. A boulevard 100 feet wide, called Pennsylvania, will lead eastward from the plaza of the station, span the Schuylkill, and follow a widened Filbert Street to City Hall Square. Provision has been made for underground trackage in the city east of the river, for tearing down the Market Street viaduct, and for abandoning the Broad Street Station. Many of the streets in the area involved are to be widened, the terminal division will be electrified, and improvements will be made in the municipal street-railway system to provide better contact with the Pennsylvania lines. This entire project will cost $60,000,000, the city paying $15,000,000.

Reading Improvements. This road will construct a handsome new station, with Doric façade, at Broad and Huntingdon streets, will electrify several of its branches, and eliminate city grade crossings, expending $3,000,000.

Baltimore & Ohio Project. This road has entered into an agreement with the city to carry out the following plans: A new station of outstanding architectural design will be erected on the site of the old station at Twenty-fourth and Chestnut; trackage will be rebuilt on the east side of the Schuylkill in order to permit the city to carry out its boulevard-construction plans along the river. The city will locate certain future subway stations so they will be in immediate contact with the main station. The plans call for an expenditure of $15,000,000.

Parks. In accordance with his desire to see his city a "greene countrie towne," Penn had five open spaces set apart as city parks, in the original plans. Center Square, the present site of City Hall, was in the center, and about it, serving as corners of a rectangular area, were what are known now as Washington Square, on the southeast; Rittenhouse, on the southwest; Logan, on the northwest, and Franklin, on the northeast. Thus the founder provided for a larger proportion of open space than had ever before been set apart in the planning of a city. Not only have the original "greene" spaces been preserved, but scores of others have been added, and there is hardly a home in Philadelphia not within walking distance of a park or square.

The larger parks and park areas, including grassed stretches of the boulevards, are under the management of Fairmount Park Commission, and they cover nearly 6,500 acres. Fairmount Park itself, with a total area of 3,597 acres, is the largest park in the United States wholly within the same municipal limits. Grandparents of to-day remember it as the site of the Centennial Exposition of 1876, held one century after the adoption of the Declaration of Independence. The broad landscapes of the park spread out on both sides of the Schuylkill for miles, and it takes on an aspect of Alpine loveliness in the northern part, where the deep gorge of Wissahickon Creek is preserved in its picturesque, unspoiled beauty. Among the notable features within the park are several colonial residences associated with the city's early history; a fine Aquarium; an extensive Zoölogical Garden; William Penn's house (see *Historic Buildings*, above); Memorial Hall, originally the art gallery of the Centennial, now a museum of art and industry; Horticultural Hall, also a relic of the Centennial, now housing a collection of rare plants; and numerous monuments and memorials to famous personages. Boat House Row, on the east bank of the Schuylkill, is the haunt of rowing enthusiasts.

Second in interest to Fairmount is League Island Park, on the extreme south, which the Sesqui-Centennial committee selected as the central site for the exposition held to celebrate the one hundred-fiftieth anniversary of the Declaration. The park covers 275 acres and



Photo· Keystone

FAIRMOUNT PARK
Main entrance, with Logan Fountain in the foreground

is beautifully landscaped. Pennypack Park, in the northeastern section, covering 1,097 acres, is second to Fairmount in size. Cobb's Creek Park, extending four miles along the western boundary of the city, is third with 621 acres. A small park of twenty-seven acres in the southwest, Bartram's Botanical Garden, is notable as being the oldest botanical garden in America, having been founded in 1728.

Under control of the Bureau of City Property are numerous small plots, some having special historic interest, and others designed for rest and recreation. Notable among these small areas are Independence Square (see above, *Historic Buildings*), and Penn Treaty Square, at Beach Street north of Columbia Avenue, marking the place where Penn made his famous compact with the Indians.

Boulevards. The expansion of the boulevard system is one of the major features of the city-improvement plans. The Parkway, extending diagonally for over a mile through the heart of the city, connects City Hall Square and the Spring Garden entrance of Fairmount Park. At the park end of this spacious drive is the new municipal Art Museum, and farther on is the new Free Library building (see below, *Libraries and Museums*). An extensive architectural program is under way, and will give this beautiful thoroughfare impressive dignity in the years to come. Another of the more recently completed boulevards is Roosevelt, a part of the coast-to-coast Lincoln Highway. It leads from Broad Street to the city limits in a northeasterly direction, and is justly admired for its attractive parked areas and borders of trees. Cobb's Creek Parkway is a charming drive in West Philadelphia. Eventually, the Schuylkill will be skirted on both sides by broad highways, built in connection with the railway-terminal improvements.

Educational Facilities. Besides maintaining an excellent public-school system, Philadelphia is a center of higher learning. In West Philadelphia is located one of America's great universities, the University of Pennsylvania. It was established in 1740 as a charitable secondary school [for an account of its growth, see the article PENNSYLVANIA (Education)]. The Drexel Institute, offering courses in art, sciences, and industrial training, has an endowment of $2,000,000, the gift of A. J. Drexel. It, too, is located in West Philadelphia. There are professional schools in law, dentistry, medicine, and pharmacy; some of them are independent, and some are branches of the university. Other schools include Temple University, founded in 1884 by the late Russell Conwell, and having an enrollment of 12,000; Pennsylvania Academy of the Fine Arts, schools for the deaf and the blind, the School of Design for Women, the Women's Medical College, special schools of the Roman Catholic, Episcopal, and Lutheran churches, and several maintained by the Quakers (Society of Friends). Girard College (which see), an institution for orphaned white boys, occupies a campus of forty acres about a mile east of Fairmount Park. Bryn Mawr College, one of the best-known American colleges for women, is but a few miles from Philadelphia.

Libraries and Museums. The largest library organization is the Free Library; established in 1891, it has now over thirty branches, and a yearly circulation of over 4,000,000 volumes. The new building of the

main library is on the Parkway at Nineteenth Street and Vine, near Logan Square, in a setting worthy of its architecture, which is modeled after that of a structure on the Place de la Concorde, Paris. Of special interest historically is the library of the Library Company of Philadelphia, which had its origin in the Junto, a research club founded by Benjamin Franklin in 1727. The library was formally organized by Franklin in 1731, and is the oldest subscription library in America in continuous existence. Its collections are housed in the main building at Locust and Juniper, and in the Ridgway Branch at Broad and Christian.

Among numerous special libraries, mention should be made of the library of the Law Association of Philadelphia, one of the largest of its kind in the United States; and the collections of the American Philosophical Society, which Franklin founded in 1743. Most of Franklin's letters are preserved in the archives of this institution, the oldest academy of science in America Another fine collection is the technical library of Franklin Institute, which still occupies the building erected in 1825 on Seventh Street below Market.

Besides the botanical, zoölogical, and art accumulations in Fairmount Park, Philadelphia has several museums notable for the character and extent of their exhibits. The Philadelphia Commercial Museum, at Thirty-fourth and Pine, houses a unique collection of raw materials and manufactured products from every country in the world. Of outstanding merit are the bird, plant, and other natural collections of the Academy of Natural Sciences, at Nineteenth and Race, and of equal range are those of Wagner Free Institute, at Seventeenth and Montgomery Avenue. Some of the priceless historical collections of the city have been mentioned above, under *Historic Buildings*.

Art and Music. The principal art collections of the city are arranged in the beautiful Art Museum on the Parkway, which occupies an elevation commanding an impressive view of the drive. The galleries consist of a series of period rooms that give a panorama of the story of art from the earliest times and in all countries. The Pennsylvania Academy of the Fine Arts, on Broad and Cherry streets, has a fine collection of early and modern American paintings, and there are other notable exhibits in Drexel Institute, Memorial Hall (Fairmount Park), and Johnson Art Gallery, on South Broad Street.

Philadelphia is a center, too, of worth-while music. Among the great symphony orchestras of the country, the Philadelphia organization holds high rank. During the regular season of twenty-nine weeks, concerts are given Friday afternoons and Saturday evenings at the Academy of Music. The city has numerous choral societies, and three professional grand-opera organizations. Performances of the Pennsylvania Grand Opera Company, formerly the La Scala, are given in the Metropolitan Opera House, which has a seating capacity of four thousand.

Recreation Facilities. Philadelphia has two of the largest stadiums in the United States—the Municipal Stadium, erected for the Sesqui-Centennial in South Philadelphia, and that of the University of Pennsylvania, in Franklin Field. They have seating capacities of 125,000 and 83,500, respectively. Golf, tennis, and polo are amply provided for in and about the city, and the Schuylkill affords a splendid rowing course where intercollegiate and international contests are held. The city Bureau of Recreation has under its management scores of playgrounds, recreation centers, and swimming pools, available to the general public.

Local Transportation. A well-equipped electric street-car system serves all parts of the city, and is supplemented by elevated lines and subways. Subway construction is being rapidly carried forward, and eventually the Broad Street line will be extended to League Island, the site of a United States navy yard. All sections of the Metropolitan Area are closely connected with one another by railroad, interurban, and motorbus transit facilities Ready communication with New Jersey is provided by the new Delaware Bridge, which spans the river between Franklin Square, on the Philadelphia side, and Penn and Sixth streets, Camden. The total length from one terminal to the other is 1.81 miles. This great toll bridge, one of the largest suspension bridges in the world, required four and a half years to build, and cost over $37,000,000. It was opened to vehicular traffic in 1926.

Three commercial firms are operating flying fields, and the city owns an airport in Southwest Philadelphia on the Model Farms tract near Hog Island; this is used in part by the National Guard.

A Great Manufacturing Center. Philadelphia follows New York and the Chicago industrial district in the number and importance of its manufacturing enterprises. Many producers have their factories at some distance from the city—some of them in New Jersey—but these are justly classed as Philadelphia enterprises. More than twenty-eight per cent of the value of manufactured goods for the entire state is credited to the city; these products have an average value of about $2,000,000,000 a year, and over 9,000 establishments are reported by the Census Bureau. Ten per cent of the total number of persons employed in American manufacturing are at work in the Third Federal Reserve District, of which Philadelphia is the center.

Associated with industrial Philadelphia are firms known everywhere: the Baldwin Locomotive Works, the largest makers of locomotives in the world, with a plant covering nine city blocks; Cramp's Shipyard, on the Delaware at Beach and Ball; John B. Stetson Company, at Fifth and Montgomery, manufacturers of felt hats; Henry Disston & Sons, whose Tacony plant is the world's largest factory producing saws; and J. G. Brill Company, at Sixty-second and Woodland Avenue, manufacturers of more than half of the street cars built in America. Others of wide repute are the S. S. White Dental, the Miller Lock, the Atlantic Refining, and the Atwater-Kent Radio companies. Hog Island is another large shipbuilding center, and the manufacture of aircraft is also a rapidly developing industry.

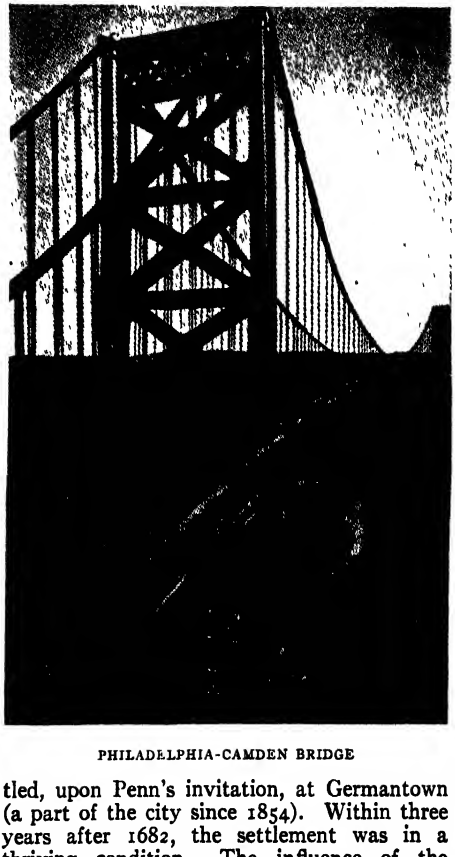
Among American cities Philadelphia is preeminent in textile production, not only in the total value of all textiles, but in each of the four textile divisions—silk goods, hosiery and knit goods, woolens and worsteds, and cotton goods. One-third of the carpets and rugs made in the United States are produced in this city.

In printing and publishing, Philadelphia enjoys the distinction of having a weekly literary magazine which sells more copies of every issue than does any other paper of any description in the world, it has a farm journal with the world's largest circulation for publications of its class. The Lippincott Publishing House is one of the oldest in continuous existence in the country. The Curtis Publishing Company, one of the leading organizations in number of publications, publishes *The Saturday Evening Post*, *The Ladies' Home Journal*, *The Country Gentleman*, the *Public Ledger*, and the *Evening Ledger*. Other great daily publications are the *Bulletin*, the *Record*, and the *Inquirer*.

The Port. Though it is a hundred miles from the ocean, Philadelphia does a thriving port business, and its water-front facilities are undergoing constant improvement. Recent projects include the construction of new piers and the dredging of the Delaware River, whereby a channel 800 feet wide and thirty-five feet deep connects the port and the sea. Over 11,000 vessels enter and clear the harbor in a year, representing nearly a score of nations.

City Government. Philadelphia is governed according to a charter that became effective in 1920. The mayor and council are elected for four-year terms. The council is composed of twenty-two members, apportioned among the eight senatorial districts of the city on the basis of population; that is, one member for each 20,000 assessed voters. The city expenditures are fixed by a budget system, and most of the city employees are under the civil service. Offices of both city and county officials, and the courtrooms of city, county, and state, are all in City Hall.

History. The first white settlement was not made by William Penn, for in 1636 a company of Swedes occupied the site, by authority of the Swedish queen, but they remained only a few years. In 1681 Penn sent Captain Markham as deputy-governor with a small company, and in July of the following year, the "City of Brotherly Love" was laid out. That settlement was permanent, and in 1683 it was reinforced by a company of Germans, who set-



PHILADELPHIA-CAMDEN BRIDGE

tled, upon Penn's invitation, at Germantown (a part of the city since 1854). Within three years after 1682, the settlement was in a thriving condition. The influence of the Quakers and Germans strongly affected Pennsylvania history for generations, and the Friends yet have their American stronghold in this section. After the Revolution, and continuing for many years, the Scots and Irish held the balance of power in the city, the effect of heavy immigration for over a decade.

Between 1682 and 1684, Penn was personally in charge of his colony. In the latter year he sailed for England, there endured a period of persecution, and when he returned, in 1699, Philadelphia had grown to be a town of 4,500 people and of over 700 residences. Two years later (1701), he chartered the city; the Penn holdings of land were enormous, and the new



OLD "HIGH STREET"

A reproduction of the principal street of Philadelphia about one hundred fifty years ago In the course of time it became the present great thoroughfare of the city, Market Street This street was a feature of the Sesqui-Centennial Exposition of 1926, and is preserved as a part of League Island Park

city and Penn were soon disputing over the taxation of his estates and various proprietary privileges which he enjoyed, as Lord Proprietor of Pennsylvania, under his charter. This controversy continued at intervals until Penn's influence was nullified by his financial ruin.

Next to Penn, the man most conspicuous in the town's affairs was Benjamin Franklin, who entered the city in 1723, carrying a loaf of bread under each arm and eating a third. Within six years (1729), he was publishing the *Pennsylvania Gazette*, and from that time he was the dominant spirit of the city. His appeal in 1747 secured 10,000 volunteers for King George's War, and led to the erection of a battery on League Island. In 1755, under a militia law then passed, Franklin was made colonel of the Philadelphia regiment. From this time, the city thought largely in militant terms, and naturally was foremost in resisting British injustice to the colonies. The spirit of opposition to England was but little tempered by a considerable number of loyalists and the Friends, the latter religiously opposed to strife.

The city was conspicuous during the Revolution by reason of the following historical events, not to mention lesser occurrences, which occurred within its borders:

October 17, 1773—Mass meeting protested against a tax on tea; its resolutions were afterward adopted at a similar meeting in Boston.

September 5, 1774—First Continental Congress met in Carpenters' Hall.

May 10, 1775—Second Continental Congress met in what is now Independence Hall.

July 4, 1776—Declaration of Independence signed in Independence Hall.

September 27, 1777, to June 18, 1778—British troops entered the city, and the expelled American army spent a terrible winter at Valley Forge

October 4, 1777—Battle of Germantown was fought, and wounded Americans were laid in rows upstairs in Independence Hall.

May 14, 1787—Convention met in Independence Hall to revise the Articles of Confederation, and on September 17 adopted the result of its labors, the Constitution of the United States.

During the entire period of the war, when the British were not threatening the city or in possession of it, Philadelphia was the seat of the Congress and, therefore, the center of the new nation's political activity. In describing the Philadelphia of that day, a historian says:

> The city was then [1784] the greatest in the country. No other could boast of so many streets, so many houses, so many people, so much renown.

Philadelphia maintained its national political and financial supremacy until some time after 1830. From 1683 to 1799, it was the capital of Pennsylvania, and the capital of the United States from 1790 to 1800. New York forged ahead of its Pennsylvania rival as a money center about midway between 1830 and 1840. While engrossed in politics and finance all these years, it was at the same time notable for its literary achievements. The first newspaper in America outside of Boston, the *Ameri-*

QUESTIONS ON PHILADELPHIA

(An Outline suitable for Philadelphia will be found with the article "City.")

What little bare rear room in this city holds memories of some of the greatest men in the nation's history?

How many cities in the world are larger than Philadelphia? How many of these are in the United States?

How many are in Europe? How many in Asia? (See list with article CITY, on page 1438.)

What does the name of the city mean? How does the name express the principles and ideals of the founder?

How and when was the achievement of American independence celebrated in this city? Why was it fitting that this celebration should be held here, rather than in New York, or in Washington?

How does the area of the city compare with that of the largest city in the country? With that of the second largest? Which of the three has the greatest average density of population?

What right has Philadelphia to its popular name of *City of Homes*?

Name three important documents that were adopted in this city, and tell what each stood for in the history of the country.

What is the most famous of the historic buildings of Philadelphia? When was it built? How much did it cost?

What is the bell which once swung in its tower called? Where is it now? What inscription does it bear?

How did it fulfill the mission indicated in its inscription more fully than its makers can ever have intended?

What is called the "most historic spot in America"?

Who made the first American flag? Describe the first flag made by her. (See the article FLAG.)

How does it happen that the home of the founder of Philadelphia no longer stands on its original site?

What notable events took place in Congress Hall?

Where was the phrase "first in war, first in peace, and first in the hearts of his countrymen" first used? Who said it?

In what building was the Constitution of the United States drawn up?

What event in the history of Philadelphia shows that lotteries were not always looked upon as they are at present?

How large a proportion of the manufactured goods made in Pennsylvania is produced in Philadelphia?

What supremacy does the city have in the making of locomotives?

How does the park area of Philadelphia compare with that of Chicago? With that of New York City?

Why can it be said that the founder of the city was not the pioneer white settler on the site?

To what sect did the majority of the early settlers of Philadelphia belong?

Who was Philadelphia's greatest citizen during pre-Revolutionary and Revolutionary times? Was he a native of the city?

What exposition celebrated the 150th anniversary of the Declaration of Independence? Where was it held?

How long did it take Benjamin Franklin to establish himself in Philadelphia, and by what means did he obtain an influence in the city's affairs?

When was the city the capital of the state of Pennsylvania? Of the United States?

What was the original educational status of the University of Pennsylvania?

How old is Philadelphia, and what is its present population?

can Weekly Mercury, was published in Philadelphia in 1719; it was the home of *The Pennsylvania Packet*, the first daily newspaper in America, which began its existence in 1784. Here also were published the first American editions of the Bible, in German (1743) and in English (1781).

Earlier than any other section of the country, Philadelphia raised its voice in opposition to slavery when, in 1688, the Germantown residents protested against the presence and extension of the slave traffic in the United States. The first abolition movement started in this city, by a convention in 1784; the American Anti-Slavery Society, destined to become influential, was formed here in 1833.

It was in 1854 that the territorial limits of the city were made coextensive with Philadelphia County; eleven villages were united with the city under one great municipal government. In 1876 there was held in the city the Centennial Exposition, commemorating the hundredth anniversary of American independence; it was acknowledged the greatest event of the kind up to that time in the history of the world. Six years later (1882), the city celebrated the two-hundredth anniversary of the founding of the city, and in 1908 a great pageant celebrated the two hundred twenty-fifth anniversary. In 1887 another centennial, that of the signing of the Constitution of the United States, was celebrated. In 1926 the great Sesqui-Centennial celebration was held (see CENTENNIAL EXPOSITION for the detailed story). G.W.E

PHILAE, *fi' le,* a small, uninhabited island in the River Nile, about five miles south of Assuan, just above the First Cataract. It is a granite rock 1,000 feet long and 500 feet broad, and on it stand some of the most interesting ruins of Egypt. The building of the great dam on the Nile, between Assuan and Philae, caused the submersion of the famous temple to Isis. See EGYPT (Modern Cities: Assuan).

PHILEMON, *fih le' mon.* See BAUCIS AND PHILEMON; STORY-TELLING.

PHILEMON, EPISTLE TO, the shortest of the four letters written by Paul during his captivity. It is addressed to Philemon, a fellow worker and a man of means, at whose house the Christians of Colossae held their meetings. Renan calls this epistle a masterpiece in the art of letter-writing. It deals with the problem of a runaway slave belonging to Philemon, whom Paul returned to his master. He urges Philemon to receive him as a freeman and as a brother in Christ. It is said that this letter had much to do with the gradual change in public opinion in relation to slaves. See PAUL, SAINT.

PHILETAS, *fi le' tas,* **OF COS.** See DWARF.

PHILIP, *fil' ip.* See APOSTLES.

PHILIP, KING. See KING PHILIP.

PHILIP, THE EVANGELIST, one of the seven deacons appointed by the early Church in Jerusalem (*Acts* VI, 5). He took a liberal stand with regard to the interpretation of Jewish law, and was the first to oppose the exclusiveness of the Jewish Christians. He preached in Samaria, baptized the Ethiopian eunuch, and was visited by Paul in Caesarea, on the latter's final journey to Jerusalem. Later traditions of his life are greatly confused with those of Philip the Apostle. See APOSTLES.

PHILIP II (382-336 B.C.), king of Macedonia, the real founder of its greatness. He was the youngest son of Amyntas II, was born at Pella, and in his youth spent several years as a hostage at Thebes While there he had the opportunity to learn from Epaminondas and Pelopidas, the two foremost Grecians of the day, much of military science and the political status of Greece. In 359 B.C., on the death of his brother Perdiccas, Philip was made regent for the infant heir, Amyntas, but he soon set aside his nephew's claims and made himself king. Various claimants to the throne encouraged disturbances within the kingdom, while it was threatened from without by the Illyrians, Athenians, and other enemies; but the young king overthrew the pretenders, defeated the Illyrians, bought off the Athenians, and within two years was established on the throne.

Philip's Aims. His great ambition was to become master of all Greece; his career of aggression was begun by attacking the Greek towns on his border. Amphipolis was captured in 357, Pydna and Potidaea in the next year, and he then took the Thracian town of Crenides, which he renamed Philippi, and which gave him control of the rich gold mines of Thrace. In 354 Methone submitted, and in 347 Olynthus, to which Athens had sent aid too late. Meanwhile, he had advanced as far south as Thermopylae, but found it too strongly guarded by the Athenians, and turned back. In 346 the Thebans appealed to him for help against the Phocians, who had held the sacred city of Delphi for many years, and when he proved successful, he was given the place in the Amphictyonic Council which had previously belonged to Phocis. This was in recognition of him as a Greek among Greeks.

Opposition of Demosthenes. At Athens Demosthenes perceived the plans of the Macedonian king, against whom he thundered forth his famous *Philippics*, but the Athenians were hard to rouse. Philip's attentions during the years 345-339 seemed confined to Thrace, where with great difficulty he established his supremacy. In 338 B.C., he again entered Greece, this time at the request of the Amphictyonic Council, which desired his help against the Locrians. Now Demosthenes succeeded in stirring up Athens to a sense of danger, and in persuading Thebes to join in a defensive league; but the

allied armies were completely defeated by Philip at Chaeronea, in August, 338, and Greek independence was at an end. With all Greece in his control, Philip began to plan an invasion of Persia, but in the summer of 336 he was assassinated by a Macedonian youth, possibly at the instigation of Olympias, his divorced wife.

Estimate of His Career. Philip's fame has suffered because of the greater glory of his son, Alexander the Great, but he stands out as one of the truly noteworthy rulers of all times. His dream of a Greek empire, in place of the little Greek states, with their jealousy and strife, was in advance of his age, and the means by which he secured it, both military and diplomatic, were masterly. He brought his army to a high state of efficiency and developed the famous "Macedonian phalanx," which did such effective work in the campaigns of his son.

Related Subjects. The reader is referred in these volumes to the following articles.

Alexander the Great	Macedonia
Demosthenes	Phalanx

PHILIP, the name of several French kings. Of these, Philip II, IV and VI are of greatest interest and importance.

Philip II (1165-1223), known as PHILIP AUGUSTUS, was one of the greatest of the early French rulers, and the first to bring France into a commanding position in Europe. He was the son of Louis VII, who gave him a share in control in 1179 Philip became sole king in 1180 Contests with the great barons, some of whom had almost as much power as the king, marked the early years of his reign, and from most of them he succeeded in wresting concessions By taking the part of the sons of Henry II of England in the risings against their father, Philip forced the English king to do him homage for his possessions in France; and when Richard I (the Lion-Hearted), Henry's son, came to the throne in 1189, the two monarchs caught the spirit of the Crusades and set out together for the Holy Land.

As they quarreled on their way to Palestine, Philip returned to France and intrigued with the Emperor Henry VI against Richard, who was arrested and imprisoned on his way home. Philip also formed an alliance with John, Richard's brother, and attacked Richard's possessions in Normandy. He met with small success, and Richard's death in 1199 ended the war. Almost immediately, however, war broke out with John, Richard's successor, and the English king lost most of his French estates. In 1214 Philip was called upon to face a powerful coalition composed of the Count of Boulogne, the Count of Flanders, the Emperor Otho IV, and John of England, but at Bouvines he overwhelmingly defeated them, and effective opposition to his power was at an end.

Philip was to the full as great a statesman as he was a soldier. Reforms in administration strengthened the hold of the central government on the people; the feudal system was modified so that the king was more obviously its head; and the Church was prevented from acquiring increased power. Philip was married three times—first to Isabella of Hainault, who died in 1190, then to Ingeborg of Denmark, whom he repudiated soon after his marriage, and last to Agnes of Meran. The Pope, however, refusing to sanction this last marriage, excommunicated him, and forced him to recall Ingeborg.

Philip IV (1268-1314) was called THE FAIR, because he was, as one writer says, "the handsomest man in the world." He succeeded his father, Philip III, in 1285. The extent to which this king was responsible for the important events of his reign is a question, some authorities holding him to have been merely a figurehead, dependent on his Ministers, while others represent him as a man of force, obstinate in the attainment of any purpose on which he had set his mind. The most noteworthy happening of his reign was a contest with the Pope.

France needed money, and new taxes were accordingly levied, some of which fell upon the clergy, but in 1296 Pope Boniface VIII issued a bull forbidding anyone to tax the clergy without Papal sanction. Philip retaliated by decreeing that no metals should be exported from France, and the Pope at once submitted, as this would have deprived him of a large sum yearly. In 1301, however, trouble broke out again, when Philip had the Papal legate in France arrested Boniface at once issued another bull making most extravagant claims for the Papacy, and Philip, to make sure of the support of the people, summoned the first States-General in the history of France

Philip's representative thereupon seized the person of the Pope, who died immediately afterward; and after the brief reign of Benedict XI, Philip made his own candidate Pope as Clement V. The Papal residence was transferred from Rome to Avignon, and thus began the seventy-year period of French control of the Papacy which is known as the "Babylonish captivity."

In order to obtain money for the increasing demands of the state, Philip persecuted the Jews, the Lollards, and the Templars, finally inducing the Pope to suppress the latter order He also debased the coinage of the realm Early in his reign he came into conflict with Edward I of England, whose territory of Guienne he seized He then turned against the Count of Flanders, who had assisted Edward, and allowed his agents to oppress the Flemish people cruelly. The result was a revolt in which Philip was decisively defeated at Courtrai and compelled to relinquish his claim on Flanders

Philip VI (1293-1350), founder of the dynasty of Valois, was a nephew of Philip IV He came to the throne in 1328, on the death of his cousin, Charles IV. This led to a contest with Edward III of England, who, as a nephew of Charles IV, insisted that his claims were superior Since the defeat of Philip IV by the Flemish cities at Courtrai, in 1302, the French nobles had been anxious for revenge, and in 1328 Philip led them to victory at Cassel Relations with England grew constantly more unfriendly, and in 1337 the Hundred Years' War broke out. In 1340 the French fleet was defeated at Sluys, and six years later occurred the complete rout of the French in the Battle of Crécy, the first important battle of the Hundred Years' War (which see)

The chief feature of Philip's internal government was its extravagance. He levied taxes to suit himself, despite the protests of the States-General, and he spent immense sums on tournaments and festivities In the latter part of his reign, France was swept by the terrible pestilence known as the Black Death.

Related Subjects. The reader is referred in these volumes to the following articles

Crécy	Hundred Years' War
Crusades	Richard (I, England)
France (History)	

PHILIP, the name borne by several kings of Spain, two of whom were of special importance.

Philip II (1527-1598) was the only son of the Emperor Charles V and Isabella of Portugal. He succeeded to the throne in 1556. Owing to his early clerical education, he grew up a cold, one-sided man, with no sympathy for those whose religious convictions differed from his own. His rule was characterized by one object, namely, to stamp out opposition to the Roman Catholic faith. He first married Maria of Portugal; after her death, Mary, queen of England, became his wife. The English, however, refused to acknowledge him as king, or to help him in the war he had provoked with France, though Queen Mary sent him supplies and troops.

The reign of Philip II marks the beginning of the downfall of Spain and the loss of Spanish power at sea The Netherlands, one of the most valuable possessions of Philip, revolted, and after a struggle lasting nearly thirty years, costing Spain an enormous sum in money and men, threw off the yoke of Spain. The British destroyed the mighty Armada he sent against them in 1588, and the power of Spain as a maritime nation was shattered. Philip was more successful against the Turks; Portugal was conquered, but the commerce of Spain had suffered so terribly that the country never recovered. The Spanish possessions in Mexico and South America were harassed and plundered by British ships, and many vessels in the ports of Spain itself were captured. Mary of England, his wife, died in 1558, and in 1559 he married Elizabeth, daughter of Henry II of France, on her death, he entered into a fourth marriage with Anna, daughter of Emperor Maximilian II. Queen Elizabeth of England refused his proffer of marriage.

During Philip's reign, the Inquisition was at its height, and the king thought that in supporting its harsh measures he was really working for the ultimate benefit of mankind. He has been accused of helping in the instigation of the Massacre of Saint Bartholomew, and his proposed conquest and conversion of England appealed to him as a glorious deed for the benefit of Roman Catholicism.

Philip V (1683-1746) was the first of the Spanish Bourbon dynasty. He was the son of the Dauphin Louis and Maria Anna of Bavaria, and grandson of Louis XIV and Maria Theresa, sister of Charles II of Spain. Charles II left the crown of Spain to Philip by will, and the latter was proclaimed king in 1700. This led to the War of the Spanish Succession, with France and Spain allied against England, Holland, Austria, Prussia, Denmark, Hanover, Portugal, and Savoy. In 1713, by the Treaty of Utrecht, Philip was recognized as king, but Spain had to give up Gibraltar, Minorca, Sicily, the Netherlands, and Naples.

Philip married, first, Marie Louise of Savoy, who died in 1714. His second wife, Elizabeth Farnese of Parma, was an ambitious, scheming woman, who caused trouble throughout Philip's reign. Philip was a weakling with few virtues. In 1724 he resigned in favor of his son Louis, but when Louis died he resumed the crown, in spite of his incapacity. His son Don Carlos succeeded in capturing the Two Sicilies from Austria, and in 1741 Spain allied itself with France against Maria Theresa in the Austrian War of Succession. His wife's schemes and ambitions, combined with the plans of her favorite, Alberoni, dragged Philip into entanglements he had neither the wit to avoid nor the ability properly to master. He died at Madrid and was succeeded by his second son, Ferdinand VI

Related Subjects. The reader is referred in these volumes to the following articles.

Armada	Mary (England)
Bourbon	Netherlands (History)
Charles (V, Holy Roman Empire)	Spain (History)
Inquisition	Succession Wars

PHILIP OF SWABIA (about 1177-1208), youngest son of Frederick Barbarossa, and one of the emperors of the Holy Roman Empire (which see). Educated for the priesthood, he became bishop of Wurzburg in 1191, but in a year resigned from the Church and entered political life. Emperor Henry VI, his brother, gave him Tuscany to rule, in 1195, and in 1196 he became lord over Swabia. When his brother died, he fought to secure Henry's former possessions for the family, and was partly successful, but was assassinated.

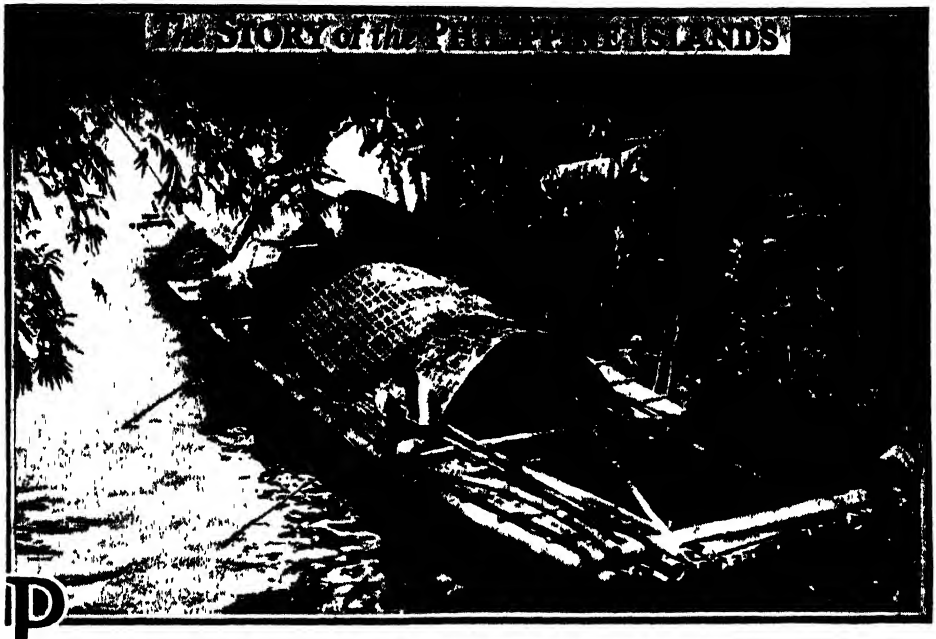
PHILIPPE. See ORLEANS.

PHILIPPEVILLE, *fe leep veel'*, a city in Algeria (which see).

PHILIPPI, *fih lih' pi*, an ancient city in old Thrace, first known as Crenides, but renamed for himself by Philip of Macedon (see PHILIP II) when he captured it some time before 350 B.C. The town was located about nine miles from the Mediterranean coast, and its nearest coast neighbor was Neapolis. The place remained under control of Philip and his successors until 168 B.C., when it fell to Roman conquerors. Philippi was famous as the scene of battles between Roman leaders who fought each other for supremacy. Here Brutus and Cassius fought against Marc Antony and Augustus, and the first named two were defeated. When Augustus became emperor, he made Philippi a Roman colony. In the Christian Era, Paul the Apostle founded here a church, from which he addressed his Epistle to the Philippians (see below). The ruins of the old town may yet be seen.

PHILIPPIANS, EPISTLE TO THE, a letter to the Christians at Philippi, written by Paul while he was a prisoner in Rome. The date is supposed to be about A.D. 62. The Philippians had been the first to help Paul, but for a long time they had done nothing to aid him in his work. He had been a prisoner in Caesarea and in Rome for nearly five years, and when he was sick and in danger of death, he received an expression of love from the Philippian Church. On his recovery, Paul wrote this letter of gratitude. See PAUL, SAINT.

PHILIPPICS, *fil ip' iks*. See DEMOSTHENES; PHILIP II (Macedonia); CICERO.



PHILIPPINE, *fil' ih pin*, or *fil' ih peen*, **ISLANDS.** Just halfway round the world from the possessions of the United States in the West Indies lie 7,083 islands of the Philippine group, only 2,441 of which are named. Unique by nature, they have also a unique story The latest chapter is the most novel—the spectacle of a primitive race not merely well governed, but taught to govern itself and prepare for home rule, at the hands of a nation from the opposite side of the world, without previous experience in overseas rule.

Location and Area. Except for Samoa, the Philippines are the southernmost territory under the American flag, for they approach to within five degrees of the equator, and extend but little farther north than the latitude of Porto Rico. From the most northern islet of the group, the mountains of Japanese Formosa may be seen on a clear day; from the most southern, a long-range cannon might almost drop a shell on British North Borneo; and from Mindanao, the largest southern island, a steamer could reach Dutch islands in a few hours. But the mainland of Asia is several hundred miles away across the China Sea—the French country of Indo-China directly west, and Canton and Hong Kong northwest.

There is said to be a legend among some of the Philippine tribes that their land was formed when a giant threw into the sea a huge mass of rock, which broke into many pieces. Of these "pieces"—the islands—but 466 are over one square mile in area. It is not surprising, then, that more than half of them have never been named, nor that two-thirds of them are uninhabited. Were all the islands placed side by side, they would occupy a total area of 114,400 square miles, which is slightly more than the area of Italy or Arizona.

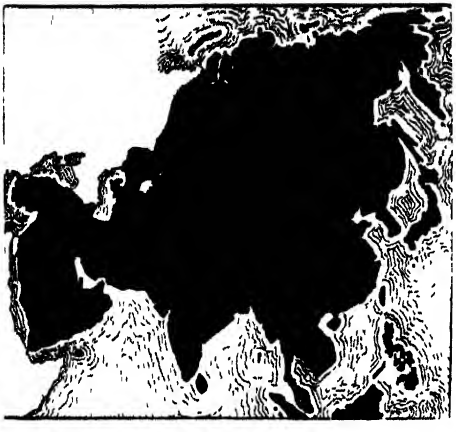
The People, Their Civilization, and the Cities

Filipinos and Other Races. A score of years after Magellan's visit to the islands, a Spanish admiral gave the name *Islas Filipinas* to part of the group, in honor of the prince who later became Philip II. In time the name was bestowed upon all of them, and the natives whom the Spaniards met were called *Filipinos*. But not all the inhabitants came under Spanish influence; to-day, those who escaped it are not included in the term. The very first invaders had found a race of curly-haired people less than five feet in height, remnants of the lowest stage of humanity. These the Spaniards called *Negritos* (little blacks). Unlike any other race on earth, the origin of these aboriginal tribes of pygmies is to this day a mystery. They live in rude shelters in the mountain forests, dependent for food upon the deer, wild boars, birds, and berries of their woodland environment.

Living in a somewhat similar state of civilization are the Ilongots, a small tribe of head-hunters in Northern Luzon, numbering some 6,000. The Igorrotes, a more industrious tribe, cover mountainsides with terraces, said to be the most remarkable in the world, on

which they raise rice and other crops by irrigation. Most of them were head-hunters, but in many instances, under American influences, the liking for this pastime has been replaced by a passion for baseball, chicken-fighting, tugs of war, and foot and horse races.

The Filipinos are Malays who came to the land not long before the Europeans, driving into the mountains other Malays who had preceded



LOCATION MAP

The Philippine Islands are represented by the slender, solid black areas southeast of the continent of Asia They are almost directly south of Japan

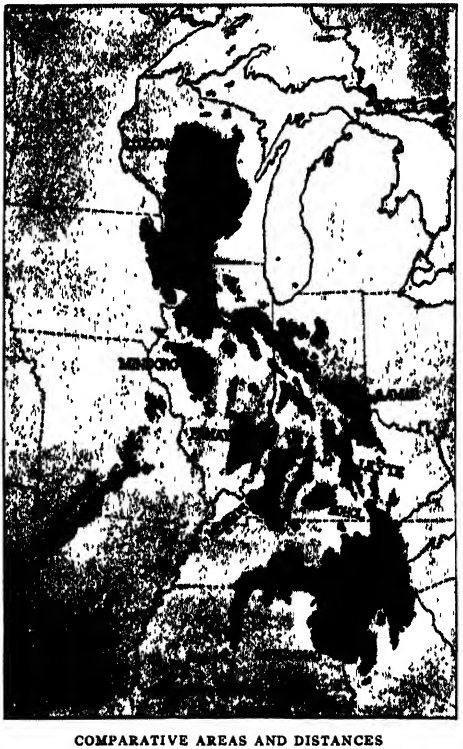
them. The Malays who fled before the Filipinos are thought by many to be now superior to them. As mountain-dwellers they have lived in a more invigorating climate, and have had to work for their living, while the Filipinos loitered in the rich tropic lands of the coast. An interesting scene is rice-thrashing; the natives thrash the rice over stones, to the tunes of guitar music.

Only a small number of the Filipinos were educated in Spanish days, and their morals were then decidedly inferior to those of their mountain brothers. Their houses, though never built in the trees or on stilts, like those of the wildest tribes, were generally neat and well-made bamboo and grass huts, but they were not so solidly put together as those of the mountain men. Still other Malays came after the Filipinos, and might have conquered them but for the arrival of the Europeans. They are Mohammedans, and so were called *Moros*, or Moors, by the Spaniards, who had driven the true Moors out of Spain but a half century before. The Moors settled in the more southern islands, introducing their somewhat advanced civilization among the natives.

Large numbers of Filipinos, and perhaps all the leaders, are *mestizos*, or mixed bloods, and count among their ancestors Spaniards, Chinese, and, in some cases, Mexicans. They are a dominant element, and control most of the trade and business of the islands. Such were the people whom the early invaders of the islands encountered, engaged in their peculiar arts of pottery-making, metal-working, or weaving of cloths, blankets, and baskets.

No one knows just how many people there are in the Philippines, for some of the tribes are still out of touch with the government. But estimates place the number at about twelve millions, chiefly Filipinos and others of Malay origin.

The most picturesque of the inland natives are the wild tribes. In their natural state, most of them wear only a breechcloth, but others are fond of bright-colored cotton fabrics of extravagant pattern. The Moros dress in



COMPARATIVE AREAS AND DISTANCES

Overlaid on the United States the Philippine Islands would extend from Northern Wisconsin to nearly the central part of Georgia; from east to west the greatest width equals the distance from Eastern Tennessee to the western boundary of Arkansas

pajama-like suits, with gaudy sashes and turbans. The Filipinos have adopted the white coat and trousers common to white men of the tropics, but when the other tribes began to imitate them, the latter commenced with hats, then adopted shirts and coats; and few of them have reached the stage of trousers or shoes. Even the efficient and well-disciplined Igorrote and Ifugao constabulary, or military police, for a number of years after American occupa-



Photo: P & A

Cleanliness Is a Filipino Virtue. Families locate as near as possible to a stream, a lake, or the sea. Wardrobes are limited, so washday, in pure, sparkling water, occurs nearly every day 5551

tion had no uniform below the waist but the "G" string and their shiny brown skins, and the well-organized police of other tribes for some time indicated their office by pinning their "stars" to their loin cloths.

The Filipinos are largely Roman Catholic, the Christian population of the islands being about ninety-one per cent of the whole. An



Photo Keystone

HELPING MOTHER TO IRON THE CLOTHES

independent Filipino Church following largely the dogma of the Roman Church was founded in 1902, and has 4,000,000 followers. Since 1898 religious freedom has prevailed. Aside from their Christianity and their dress, there is now little to distinguish the Filipinos from the other Malays.

Language and Education. Naturally, there is no universal language in this island country, although until 1930 Spanish was the official language, according to Filipino law, and it is used by the more civilized Filipinos. An endless variety of dialects and eight distinct languages are spoken. Tagalog, a beautiful Malayan tongue, is the most frequently encountered. Since the United States gained possession, however, English has been superseding Spanish, and about two-fifths of the population are able to read or understand English. Though superstition is still rife, the Filipinos are eager and quick to learn, and never before has education been introduced on such a lavish scale as in this new era of the Philippines. It is strange that so many young men study law.

One of the first acts of the American government was to import a thousand American school teachers, and in districts yet hostile the soldiers began the work of educating the native children. Of course, mistakes were made. Perhaps the most laughable was the purchase of thousands of American school books translated into Spanish, before the discovery that outside of Manila and a few other places, Spanish was as strange as Greek. It was soon found, too, that education meant to a Filipino the right to cease work forever; to combat this delusion, instruction in carpentry, masonry, blacksmithing, printing, gardening, lace-making, basketry, and other practical subjects was substituted for all branches of learning but the necessary three R's, the teachers proving by their own example that hand labor is not degrading.

From the first, the cost of the school system has been met by the people themselves. For this reason, there are not yet sufficient accommodations to make compulsory education practical, but there are over a million pupils enrolled in the public schools. Over 25,000 natives have been trained to become teachers, and as this number increases, more schools are organized. For advanced students, the University of the Philippines is maintained at Manila by the government. It has an attendance of about 6,000, and instruction is given in any subject or profession from the fine arts to agriculture. In addition, there are several private universities and a number of special schools. Much attention is given to health, sanitation, and athletics. The Santo Tomas University, in Manila, established in 1611, is proud of the fact that it is the oldest school under the American flag.

The Cities. Manila, the capital city, is described in these volumes under its title. The remaining chief cities are described in the following paragraphs:

Batangas, *bah takn' gahs,* is a seaport on the island of Luzon, seventy-two miles south of Manila. It has an excellent harbor on Batangas Bay. Interesting features of the city are the former royal palace, the convent, and the prison. Situated in the midst of a fertile territory, producing sugar, rice, coffee, hemp, corn, and fruits, its trade is very extensive. The chief manufactures are silk, cotton goods, and abaca. It is a progressive city, and since American occupation numerous expositions have been held there with a view to increasing its commerce. Population, 1926, 41,182.

Cavite, *kah ve' ta,* the principal United States naval station in the islands, is situated on Luzon Island, eight miles southwest of Manila. Near here, in the Spanish-American War, the Spanish fleet was attacked by Admiral Dewey, on May 1, 1898, and the city was occupied by United States marines immediately after the engagement. It is important as a coaling station and has an arsenal, dry docks, and repair shops, but, owing to the nearness of Manila, will probably not become a large city. The leading



Photo: U & U

An Avenue of Stately Palms. Such scenes are common in the Philippines. The trees here are coconut palms, on the island of Jolo; they line the path to the home of the master of a plantation.

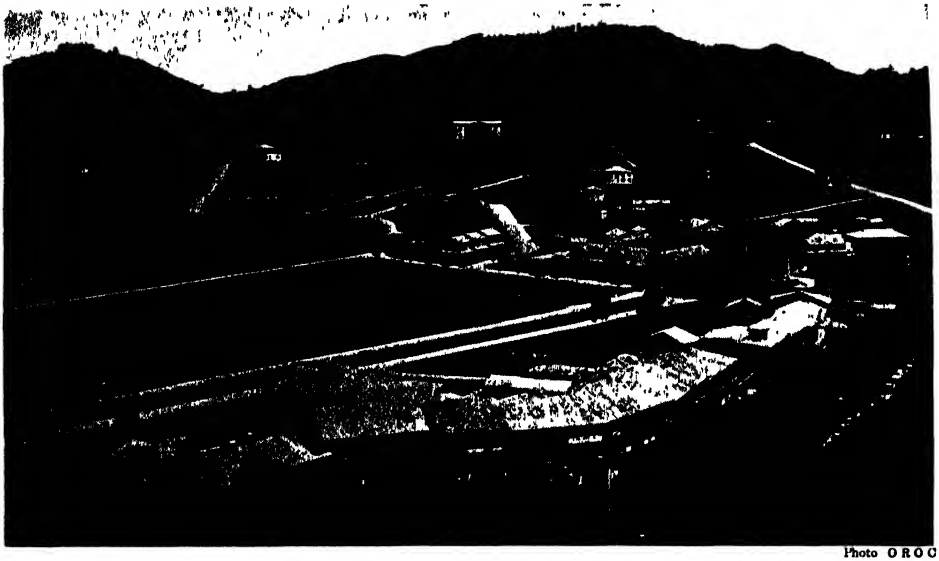


Photo OROC

BAGUIO, THE "SUMMER CAPITAL"

native industries are the manufacture of tobacco and preparation of hemp. Population, 4,500.

Cebu, *say boo'*, on the east coast of the island of Cebu, is one of the chief commercial centers of the Philippines, exporting hemp, tobacco, sugar, and copra. Cebu is regarded as one of the oldest cities in the Philippines; it was the scene of Magellan's landing in 1521, and of the first Spanish settlement in the islands in 1565. It is fortified by a picturesque Spanish fort, and contains some ancient but well-preserved churches Population, 65,300.

Iloilo, *e lo e' lo*, on the island of Panay, ranks second to Manila in commercial importance. It has a fortified harbor and exports sugar in great quantities, in addition to copra and lumber. The chief manufacturing industry is that of textiles, such as the weaving of fabrics of *pina*, or pineapple fiber Deposits of iron and gold are found in the province of Iloilo, of which it is the capital, and there are extensive forests and stone quarries. During the Spanish-American War, the Filipinos set fire to the city when it was bombarded by United States troops, and partly burned the town Population, about 49,000.

Zamboanga, *sahm bo ahn' gah*, enjoys the healthful climate of the island of Mindanao, of which it is the largest town. It is one of the chief commercial ports of the islands, exporting hemp, copra, and gutta-percha Coconut groves and rice fields abound in the vicinity. The city was settled in 1635 as a base for military protection against the pirates, and though ruined by an earthquake in 1897, it has been rebuilt and expanded considerably since the American occupation Population, about 30,000.

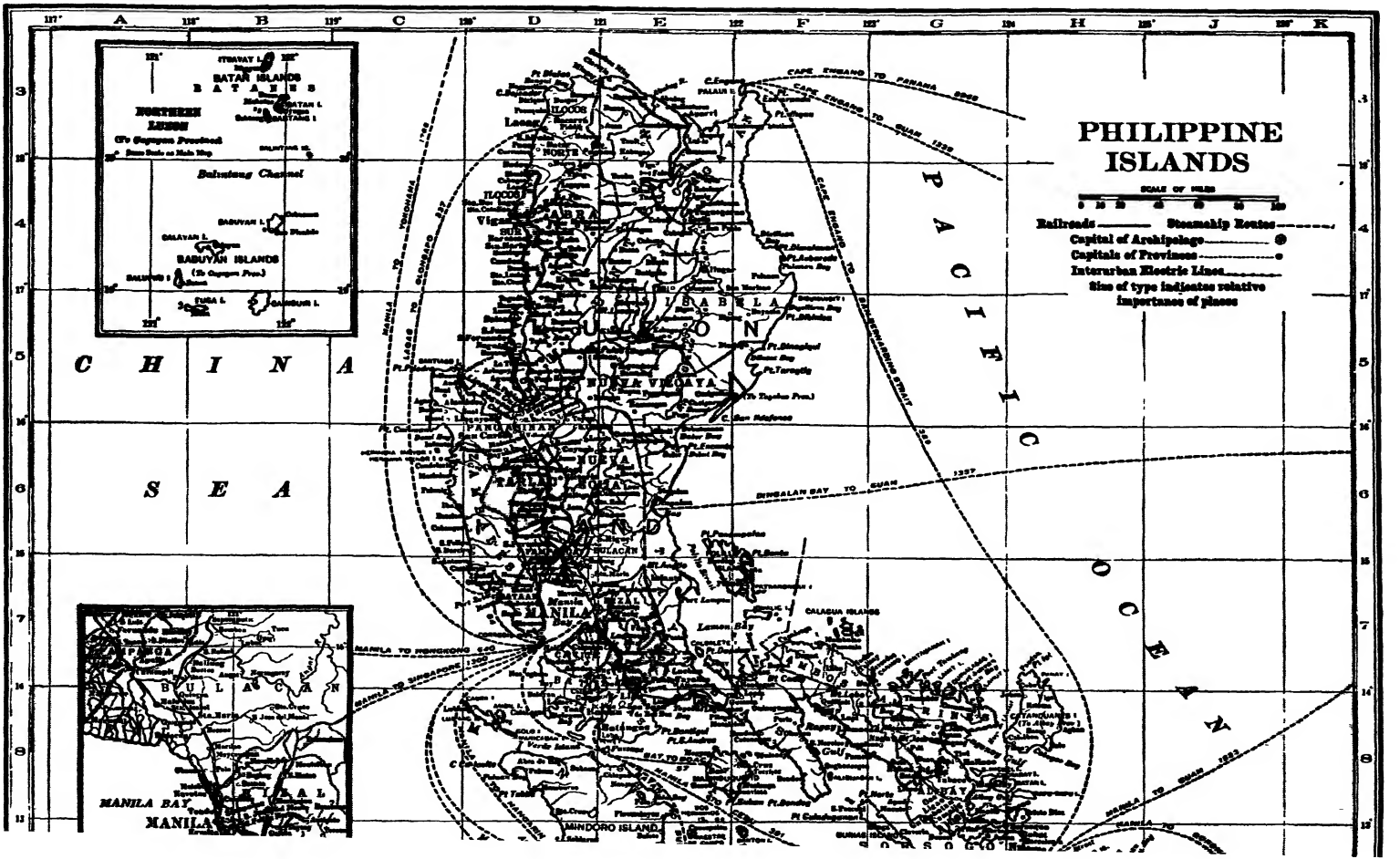
Physical Features and Resources

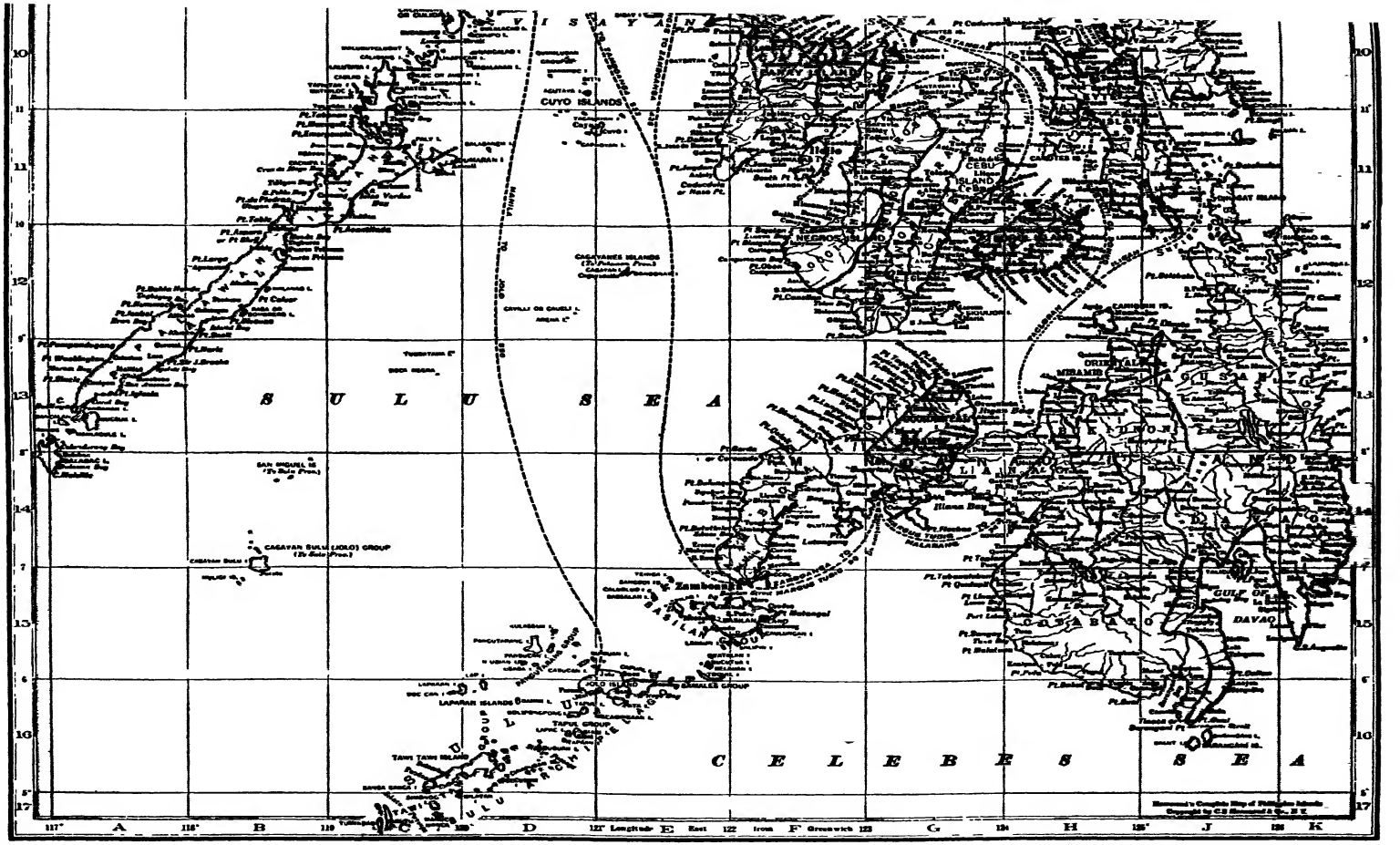
What the Islands Are Like. The Philippines are mountain ranges rising out of the sea, and the islands are connected with each other and with the other East Indies by submerged mountains. Part of the land is volcanic in origin, and there are a dozen active volcanoes, one of which is Mount Apo in Mindanao, whose crest is over 10,000 feet high. The general trend of the mountain range is from north to south, but there are innumerable rugged spurs which cut the larger islands into many isolated sections. Coral reefs fringe the shores, of which there are altogether more than twice as many miles as on all the coasts of the United States. In the largest islands there are a few rivers, but they have rapid descents, and, except near the sea, are navigable only by rafts.

In spite of the belief that they were once connected, the different islands do not have the same animals. Palawan, the long, narrow island in the southwest, and its neighbors have zoölogical types familiar in Borneo, but unknown in the other Philippines. It is not always possible to tell which of the wild animals are native and which have descended from domesticated specimens brought by man. There are, for instance, herds of wild water buffalo, or carabao (whose tame relatives are the work animals of the Filipinos), and wild hogs and deer. There is a Philippine pony, native of Spain, and not as large as the American horse, which is used as a saddle horse as well as for carriage and team work. It is not strong enough to be used as a draft horse. There are many goats, and on some of the islands, beef cattle are raised in large numbers. There are very few of the highest type of animal—the mammals, or breast-feeders. One

PHILIPPINE ISLANDS

Abra (province)..... D 4
Abra River..... D 4
Abulug River . . .E 3
Acantiladla, Point... ..C 12
Agoo, 10,653..... D 5
Agutaya Island .... .D 10
Agusan (province). .. .J 13
Alabat Island . E 7
Alaminos, 10,338 . C 5
Albay, 14,049.. . G 8
Albay (province) . .G 8
Albay Gulf. . . . G 8
Aliaga, 11,950 . D 6
Alibijaban Island F 8
Aloguinsan, 14,013 G 11
Ambil Island .D 8
Ambolon Island D 9
Ambos Camarines (province . . .. G 8
Anajuan Island .. K 12
Angat River. .. B 7
Angeles, 10,646 . D 6
Angilo, Mount E 7
Antique (province) F 10
Apalil, 12,206 . D 7
Aparri, 18,252 E 3
Apo East Pass (sea passage) . D 9
Apo, Mount J 14
Apo West Pass (sea passage) . D 9
Arayat, 12,904 D 6
Arena Island . D 12
Argao, 35,448 .. G 12
Asid Gulf . G 9
Aspera or Bluff, Point B 12
Asturias, 12,153 . G 11
Atimonan, 11,203 E 7
Aubarede, Point F 14
Babuyan Island B 4
Babuyan Islands B 4
Bacarra, 14,616 D 3
Bacolod, 11,960 F 11
Bacolor, 13,493 A 7
Bacon, 14,536 . H 8
Bacoor, 10,925 B 9
Bacuit Bay C 10
Baculin, Point K 13
Badian, 10,935 G 12
Bagambangan Island C 10
Bahia Honda, Point A 12
Bakul, Point H 16
Balabac Island A 14
Balamban, 10,603 G 11
Balaoan, 10,008 D 5
Balayan Bay D 8
Baler Bay E 6
Balicuatro Islands H 9
Balintang Channel B 4
Balintang Island B 3
Baloy, Mount F 10
Baluk Island E 15
Balut Island J 16
Bancalan Island A 13
Bangued, 12,956 D 4
Bangui Bay . D 3
Banta, Point F 6
Bantac Island D 9
Bantauanan Island G 7
Bantayan, 13,324 G 10
Bantayan Island G 10
Bantigui, Point E 8
Banton Island . F 9
Barili, 31,617 . . . G 11
Barugo, 12,360. H 10
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Basilan Group (islands) E 15
Basilan Island. F 15
Basilan Strait F 15
Bataan (province) D 7
Batac, 19,524 . D 3
Batag Island . . J 9
Batan, 14,315 ... F 10
Batan Island ... . B 3
Batan Island . H 8
Batan Islands. B 3
Batanes, (group of islands) . . . . . B 3
Batangas, 33,131 E 8
Batangas (province) E 8
Batbatan Island E 10
Bates Island C 10
Bauang, 10,032 D 5
Bayambang, 11,098 ..D 6
Baybay, 22,990 . .. H 11
Belauan Island E 15
Bilatan Island .D 17
Biliran Island H 10
Binalonan, 14,603 . D 5
Binigsian, Point F 12
Bislig Bay K 13
Bivouac, Point . B 12
Blanca, Point F 13
Boac, 15,823 E 8
Bogo, 14,915 G 10
Bohol (province) H 12
Bohol Island H 12
Bojeador, Cape D 3
Bolipongpong Island D 16
Boloboto, Point J 12
Bondog, Point F 8
Bongo Island G 12
Borongan, 13,667 J 10
Buad Island H 10
Bual, Point H 16
Bubuan Island D 16
Bucas Island J 12
Bucutua Island E 15
Bugsuk Island A 13
Bugui, Point G 9
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Bulacan (province) E 6
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Bulalacao Island D 10
Bulan, 13,431 G 9
Bulato, Point G 13
Buliluyan, Cape A 13
Buluan, Lake H 15
Buracay Island E 10
Burauen, 18,197 H 11
Burdeos Bay F 7
Burias Island G 9
Busuanga Island D 9
Butuan Bay J 12
Bututinlut, Point E 14
Cabalanan Island D 10
Cabalian, Point F 9
Caballete Island E 7
Cabarruyan Island D 5
Cabatuan, 16,497 F 11
Cabiluan Island D 9
Cabingaan Island E 16
Cabra Island D 8
Cabucan Island D 15
Cabugao Bay H 8
Cacanayat Bay F 9
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Cacraray Island H 8
Cadig, Mount F 7
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Cadlao Island C 10
Caducdula or Naso Point (cape) E 11
Caduruan, Point G 10
Cagayan (province) E 4
Cagayanes Islands E 12
Cagayan Island E 12
Cagayan Sulu (Jolo) B 14
Cagayan Sulu Island B 14
Caiman, Point C 6
Calagnan Island G 10
Calagua Islands F 7
Calamianes Group (islands) C 9
Calamian or Culion Island C 10
Calandorang Bay A 13
Calasiao, 16,539 D 5
Calavite, Cape D 8
Calayan Island B 4
Calbayog, 15,895 H 9
Calian, Point J 15
Calicoan Island C 10
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Caludlud Island F 10
Caluya Island E 15
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Camiguin Island G 8
Camiling, 25,243 H 12
Camotes Islands D 6
Campomanes Bay H 11
Canahauan Island F 12
Candaba, 11,783 .....D 6
Candolu Island . . . ...J 11
Candon, 18,828 D 4
Canimo Island. . G 7
Canipo Island . D 10
Cansilan, Point F 12
Capines, Point J 10
Cap Island D 15
Capiz, 18,828. . F 10
Capiz (province) F 10
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Capual Island E 15
Capul Island H 9
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Carigara Bay H 10
Casiguran Sound E 5
Catanduanes Island H 8
Cateel Bay K 14
Cauit, Point (Sibuyan Island) F 9
Cauit, Point (Surigao) K 12
Caulungan Island F 15
Cavilli or Cauelli Island D 12
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Cebu, 31,079 G 11
Cebu (province) G 11
Cebu Island G 11
Celebes Sea F 16
China Sea B 6
Cinapusan Islands D 16
Coral Bay A 13
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Cotabato (province) H 15
Cruz de Mayo Bay B 11
Culasi, 10,966 F 10
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Cuyo Island E 11
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Dagami, 12,591 H 10
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Dalaganem Island D 11
Dalaguete, 21,354 G 12
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Dammi Island D 16
Danao, 16,173 H 11
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Daram Island H 10
Dasol Bay C 6
Dassalan Island E 15
Davao (province) J 14
Davao, Gulf of J 15
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Dinagat Island J 11
Dinapiqui, Point F 5
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Disumangit Island F 5
Dit Island D 10
Diuata, Point J 12
Diuata Mountains K 13
Divilhean Bay F 4
Doccan Island C 16
Dondonay Island E 12
Don Island G 10
Dos Hermanos Islands E 8
Ducabaito Island C 10
Dulunquin, Point F 14
Dumaguete, 14,894 G 12
Dumangas, 12,428 F 11
Dumanjug, 22 203 G 11
Dumanquilas Bay G 14
Dumaran Channel C 11
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PHILIPPINE ISLANDS
SCALE OF MILES
0 10 20 30 40 50 100
Railroads
Steamship Routes
Capital of Archipelago
Capitals of Provinces
Interurban Electric Lines
Size of type indicates relative importance of places
BATAN ISLANDS
BATANES
NORTHERN LUZON
Balintang Channel
BABUYAN ISLANDS
CHINA SEA
PACIFIC OCEAN
LUZON
MINDORO
PANAY
NEGROS
CEBU
LEYTE
SAMAR
MINDANAO
MANILA
MANILA BAY
CAPE ENGAÑO TO PANAMA 8000
CAPE ENGAÑO TO GUAM 1550
MANILA TO HONGKONG 650
MANILA TO SINGAPORE 1500
MANILA TO SHANGHAI 1200
MANILA TO AMOY 1000
MANILA TO GUAM 1550
SURIGAO STRAIT
SAN BERNARDINO STRAIT
BALABAC STRAIT
SIBUTU PASSAGE
SULU SEA
CELEBES SEA
MINDORO ISLAND
CALAMIAN ISLANDS
CUYO ISLANDS
SULU ARCHIPELAGO



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How to Read a Map. See page xvi, facing text page 1.

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species of wild cat, squirrels, bats, lemurs, and monkeys are found, and several peculiar genera known nowhere else in the world. There are beautifully colored birds of many sorts, among them parrots typical of the tropics, huge monkey-catching eagles from the mountains, and orioles, larks, swallows, and other forms familiar in America. Snakes, large and small, flying lizards, iguanas, crocodiles, sometimes eighteen feet long, and endless varieties of insects infest the jungles. There are many kinds of fish, including both freshwater and marine species, although the latter are by far the more abundant. Shells and jewels from the pearl oysters prove a valuable resource in the Sulu Archipelago.

Away from the mountainsides, where pines are frequent, the vegetation of the Philippines is typical of the tropics. Bamboos and banyans, bananas and coconuts, palms, mangroves, tree ferns, rubber and gutta-percha, and hundreds of other valuable trees cover much of the land. Coconuts are cultivated extensively, the islands ranking foremost in the production of copra and coconut oil. Of several hundred fiber plants, the best-known is a sort of banana called *abaca*, from which comes the famous manila hemp, extensively cultivated for ropes, binder twine, cloth, and manila paper. Over one-fifth of the country bears a wild grass about three feet high. Lumber forests occupy 80,000 square miles, and these only recently began to be exploited.

Although seven-eighths of the area is uncultivated, the fertile soil, together with the marvelous system of agriculture, including irrigation and the terracing of hillsides, produces great crops of rice, the main diet of the Filipino people, sugar cane in great abundance, coconut products, hemp, maize, and tobacco. Sweet potatoes, bananas, and a variety of vegetables unknown to other countries are also grown. The islands are rich in mineral wealth, especially gold, and some silver, usually alloyed with gold, iron, and platinum, but these resources are as yet little developed. Copper, lead, zinc, and manganese are present, though no production has been reported. Important non-metallic minerals are coal, limestone, gypsum, building clay, and salt. Fishing ranks second to agriculture in production, and the catch supplements the diet of rice.



Photo U & U

A NATIVE RICE MILL

The struggle for existence in the islands makes it necessary for the men, as well as the women, to engage in the work of the home, contrary to the custom in many countries of the East. A Tagalog man and wife are shown here pounding rice

These islands are expected to help solve the question of rubber production for American consumption. The island of Mindanao, over a large part of its area, is known to be well adapted to rubber-tree culture, as are portions of some of the neighboring smaller islands. The Philippine legislature, controlled by the element which for years has been demanding independence for the archipelago, in refusing to sanction legislation favorable to immense rubber plantations, has delayed development of the industry. The two men who control the political situation are Manuel Quezon and Señor Osmena.

Some of the Islands in Detail

Luzon, *loo zon'*, is the largest and most important of the Philippine Islands. With an area of 40,814 square miles, it is about the size of Kentucky. As it is the most northern of the islands, the climate there is more agreeable than in the others, and attracts a greater proportion of the inhabitants. The interior is mountainous, and inhabited by wild animals and half-civilized tribes who live by hunting. The vegetation is luxuriant, and in addition to the valuable forests, agricultural products are grown in abundance, making the island one of the most wealthy of the group. The coast line is decidedly irregular; there are

numerous excellent harbors and bays, of which Manila Bay is the most important.

Mindanao, *min dah nah' o,* is the second largest island, lying at the extreme southern end of the archipelago. About 37,000 square miles in area, it is a little larger than Indiana. Its extremely irregular coast line measures nearly 1,600 miles. The mountainous interior is an almost impenetrable jungle, and contains some of the highest peaks of the Philippines, including the volcano of Apo. Because of the volcanic character of the island, there are frequent and severe earthquakes, and numerous mineral and hot springs abound. Most of the land is undeveloped, though this is the richest of all the islands in soil and forests. Lying within ten degrees of the equator, the island is subject to heavy rainfall, and the climate is hot and humid, but relieved by refreshing breezes from the mountains. About half the population are Mohammedan Moros.

Sulu Islands. These constitute a chain of some 180 islands, besides hundreds of tiny rocklike projections, lying between the Celebes and the Sulu seas, and extending from Mindanao nearly to Borneo. They are the most southerly group of the Philippines, and have a combined area of about 1,560 square miles The natives are chiefly Moros. For governmental purposes the Sulu Islands constitute a district of the Filipino province of Moro. The islands produce a great quantity of valuable wood, including teak, sandalwood, bamboo, and palms. Rice, cocoa, maize, bananas, oranges, and mangoes are cultivated, and there is an extensive trade in pearl shells. Oxen, swine, goats, and poultry are abundant, and wild boars and deer are common.

Negros, *na' grose,* lying between Cebu and Panay, is the fourth in size among the Philippines, covering an area of about 4,900 square miles. It is roughly rectangular in shape, and its coast line is steep and even, permitting few harbors. Its vast forests, roamed by savages, are filled with valuable timber, teak being prominent. The soil is fertile, and agriculture is the leading industry, with sugar the main crop; fishing ranks second.

Cebu, *say boo',* is a small oblong island 130 miles long and about twenty miles wide, lying east of Negros. Its mountains contain gold and silver, iron, coal, and petroleum, and its fertile soil produces sugar, tobacco, cotton, rice, and hemp. The island is particularly noted for its excellent mangoes and its cornucopia-shaped sponges. Cebu (see under *Cities*) is its capital and chief port.

Palawan, *pah lah' wahn,* the most western of the islands, is an elongated strip of land about 275 miles in length and with an average width of fifteen miles. It lies parallel with the Sulu Islands across the Sulu Sea, and with its dependent islets forms a chain connecting Mindoro with Borneo. Its area of 4,500 square miles places it fifth in size among the Philippine Islands. The island is peculiarly noted for an underground river, unexplorable beyond the distance of three and a half miles, where the roof of its cavern rests on the river. The Iwahig colony on Palawan Island is an interesting and successful experiment in criminology. One thousand prisoners from the penitentiary at Manila, as a reward for good conduct, are allowed to live here and pursue agriculture or industries as they choose. They govern themselves for the most part, and make their own laws. The dependent island of Culion is a famous leper colony (see LEPROSY).

Mindoro, *meen do' ro,* lying south of Luzon, is the seventh in size among the Philippines. With its dependent islands, it has an area of about 4,024 square miles. It is believed to have considerable mineral wealth, but its principal importance lies in the products of its immense and almost impenetrable forests. The climate is unhealthful, and the island lies in the path of the typhoons, making it less attractive for exploitation and cultivation; consequently, it remains backward and undeveloped.

Panay, *pah' ni,* with its area of 4,448 square miles, ranks sixth in size among the islands. Its fine harbor at Iloilo is the chief sugar port of the Philippines. Less densely wooded than the majority of the islands, Panay, with its numerous deer, its gentle slopes, and frequent streams, presents a pleasant, parklike appearance. The soil is fertile and rich in agricultural produce. The island is progressive, and is active in manufacturing and in commerce, having railroads and an extensive trade with the rest of the archipelago.

History and Government

Spanish Days. It was on the first voyage round the world, in the spring of 1521, that Magellan discovered Mindanao, Cebu, and smaller islands, and fell while aiding one native chieftain in a little inter-tribal battle. Though, by a treaty made eight years later, Spain relinquished all this part of the world to Portugal, Spaniards from Mexico made a permanent settlement at Cebu in 1565, and founded Manila, their capital, in 1571. Near the coast they met with no serious opposition except from the Moros. Chinese pirates and attacks by the Dutch proved to be the greatest obstacle to Spanish occupation. Spanish friars went boldly into the interior, learned the native dialects, and converted the only large body of Asiatics that has ever become Christian.



Photos: P & A; U & U

Labor in Rural Sections. The rice farmer, behind the slow-moving carabao, contentedly tills his fields. In the lower illustration, workmen are opening coconuts. The dried meat of the coconut, known as copra, is made into coconut oil, and eventually into soap.

Undisturbed in the next three centuries, except by the British occupation of Manila from 1762 to 1764, the Spanish established their government over most of the people, though they never penetrated the interior of the larger islands, nor subdued the Moros. The friars dominated all. The typical Filipino village of about the year 1900 contained a well-built stone church, the comfortable residence of the *cacique*, or village dictator, and several hundred poverty-marked huts. Some of the natives were taught to read Spanish, but few of them were permitted to learn to write. Furthermore, there was a strict censorship over all printed matter coming from Europe, nothing with a modern tendency being permitted. Devotional tracts, but not the Bible, were translated into native tongues, and Filipinos were permitted to become priests, but not friars, for the friar orders controlled rich lands. At the University of Santo Tomas, founded in 1619, nineteenth-century students of physics were permitted to look at, but not to handle, the generously provided and up-to-date apparatus, and studies such as economics were forbidden.



Photo Wide World

STRANGE MATERIAL FOR A DRESS

A high-class Filipino señora posed in a gorgeously embroidered gown made of fibers of the pineapple plant

The Awakening. Under such circumstances, it is not surprising that the revolt, when it came, was directed not against the Spanish government, or the Church, but against the friars and the oppressive and extorting caciques. José Rizal, a Filipino with Chinese and Spanish blood, who had received the degree of M.D. in Madrid and Ph.D. in Berlin, published in 1886 a novel called *Noli me tangere* (Do not touch me), exposing the unfaithful representatives of the Church and their allies, the caciques. Forced to flee to Europe, he later returned and organized a reform party, was banished at the friars' demand, and finally brought from Spain and executed in 1896. The Americans have made the anniversary of his death the national holiday of the Philippines.

The suppression of Rizal's reform movement caused the formation of a secret society, the *Katipunan*. After several hundred of its members had been banished or imprisoned, open revolt came in 1896. Led by Emilio Aguinaldo, a Filipino of one-fourth Chinese blood, the revolutionists successfully fought the few Spanish troops until, in December, 1897, the government paid Aguinaldo and his aids to leave the country, and promised to limit the power of the friars. Aguinaldo and his associates, contending that certain promised reforms had not been carried out, organized a revolutionary group at Hong Kong.

The Americans Arrive. After the United States had declared war with Spain in April, 1898, Aguinaldo and his followers saw an opportunity to use the Americans to expel the Spanish from the Philippines, and later, if the Americans refused to evacuate, they planned to attack them. About two weeks after Admiral Dewey had sunk the Spanish fleet at Cavite, in Manila Bay (May 1, 1898, during the Spanish-American War), Aguinaldo arrived, and Dewey sent him ashore. He was disappointed at first, for he was seeking power and glory for himself. When Manila surrendered, he wanted a palace for himself and prizes for his men; rebuked, he set out with his troops on a campaign of guerrilla warfare.

In the meantime, a treaty signed in Washington allowed the United States to occupy the city, bay, and harbor of Manila, pending peace negotiations. During this time, Aguinaldo had proclaimed the Philippines independent and himself their president, and was seeking foreign recognition of his government. But the Americans continued to hold Manila Bay.

In December, 1899, President McKinley announced that the Philippine Islands had been ceded to the United States upon payment to Spain of $20,000,000. At that time, few people in the United States knew what or where the Philippines were, and others bitterly opposed the acquisition of the empire on the other side of the world; anti-imperialism became a leading issue in the Presidential campaign which followed.

The first task of the new owners of the islands was military. The first Philippine commission was appointed in January, 1899, and consisted of the president of Cornell University, Jacob G. Schurman, Admiral Dewey, General E. S. Otis, Charles Denby, and others whose principal duty was to conciliate Filipino leaders and spread American propaganda. Aguinaldo led the opposition, claiming that the Americans had promised him to withdraw and leave the islands independent, and for two years he continued his hostilities. After his remarkable pursuit and capture by Funston, March 23,

PHILIPPINE ISLANDS



American Type of High School



Something New in the Philippines—A Trade School



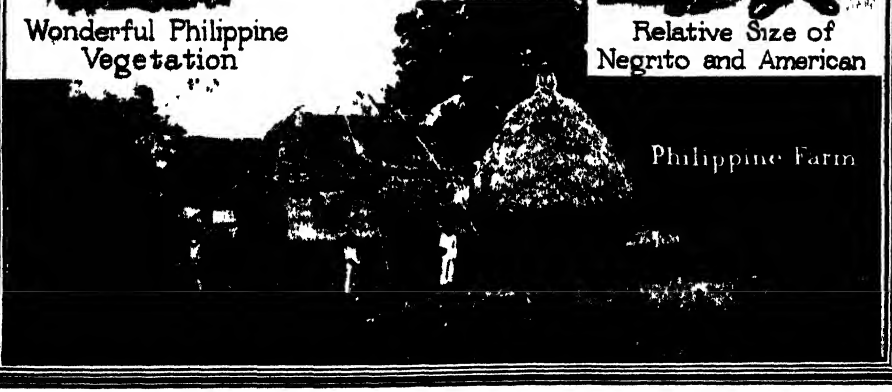
Wonderful Philippine Vegetation



A Native Barge



Relative Size of Negrito and American



Philippine Farm



Photo. U & U

A JAIL LIGHT AND AIRY AND SUFFICIENTLY STRONG

This is on the island of Luzon, between Manila and the summer capital up in the mountains Prisoners may enjoy a view of marvelously beautiful scenery The jail keeper has little trouble with his charges, for it is said that no one attempts to escape from the flimsy structure.

1901, American rule was rapidly extended and civil government replaced military rule.

A New Way to Colonize. When the "Yankees" commenced their work in the Philippines, the English, Dutch, and other experienced Far Eastern colonizers looked with great interest upon the American attempt to handle an entirely new problem. Six months before the fall of Aguinaldo, a civil commission of five, headed by Judge (afterward President) Taft, and including two professors, a general, and a former chief justice of Samoa, had assumed the government of Manila, and as rapidly as possible was given control over the rest of the territory.

Nation-building surely describes the work of the Americans in their Far Eastern colony. Every act of the civil authorities has had in view the lifting of the natives to intelligent citizenship. Education and communication have been instituted as rapidly as possible, as the chief means to this end. Nowhere has the effect of mountains upon history been more strikingly illustrated than in the Philippines. Many tribes lived in perpetual hostility to their neighbors because there was no easy means of communication, and because each had its own dialect and could converse with outsiders only in signs. Acting on the principle that acquaintance promotes friendship, the Americans penetrated where even the most peaceful friars failed, built roads, trails, and bridges, enabled the natives to talk to each other in English, and substituted inter-village contests in athletics for head-hunting rivalry. None of this work was done for purely military reasons, as in so many colonies. All the cost has been borne by the natives, and they have been taught to build their own roads, and to quarry, cut, and lay the stone for their schoolhouses and provincial buildings.

Roads, Railroads, and Commerce. The first and worst mistake which the inexperienced Americans made in road-building was in overlooking the terrific force of the tropic rainfall. Sometimes over 100 inches of water fall in a year, and twelve inches in a day is not unusual, almost twice as much as in the entire rainiest month in the rainiest parts of the United States. A good macadam road could be washed out in a month, and plain dirt-surfacing was usually found of no value at all. The cost of the road fifty-five miles long to Baguio, the summer capital, was estimated at $75,000, but it was not completed until over $2,000,000 had

been spent upon it, owing to the fact that even its supposedly solid rock base was dissolved by the freshets. There are now over 1,000 miles of first-class concrete roads in the islands, each mile of which has in the rainy season an attendant, or caminero, to keep it in constant repair; in the dry season, one man tends two miles. With the less permanent roads, there is now a total of about 6,500 miles.

At the end of the Spanish rule there were 120 miles of privately owned railroad in Luzon. Americans added several hundred miles to this total, and they constructed lines in Cebu and Panay, the government assuming control of all roads, in all some 800 miles. Steamship lines between the islands have been encouraged by subsidies, in order to unite their peoples.

The results of good government are now showing in dollars and cents. Sugar continues to be the most valuable export, but other articles are increasing in importance, as related above. Factories have recently been established to make coconut oil in the islands; sugar refineries are numerous, and the manufacture of cigars, embroideries, hats, and fiber products is increasing

Half the imports of the islands are from the United States, for there has been free trade between the two countries since 1909. Japan and the United Kingdom share generously in the commerce of the Philippines. Rice is still brought from Indo-China in large quantities, especially in years of drought.

Social Reforms. The chief task in connection with the Filipinos has been to inspire them with ideas of industry. Some of the most earnest work has been done in the prisons, where inmates were often habitual petty criminals, and so successful has it been that workmen sometimes give as a recommendation that they have served a term in Bilibid.

Sanitation. As in all tropical countries where the United States has entered, a wonderful task has been performed in teaching cleanliness. Plagues of all sorts have been eradicated, and the physical standard of the people has been raised. Doctor Victor Heiser accomplished for the health of the Philippines what Doctor Gorgas did for the Panama Canal Zone.

American Rule or Self-Government. There are few questions of national or international politics so difficult for an individual to solve without being influenced by prejudiced opinion as is the problem of the future of the Philippines. The Republican party in the United States, which was in power when the islands were acquired, has always advocated keeping them until it was evident that the Filipinos were fully capable of enlightened self-government. The Democrats have as consistently urged giving them their independence; President Wilson in his first message to the Filipinos said:

We regard ourselves as trustees, acting not for the advantage of the United States, but for the benefit of the people of the Philippine Islands.

In general, the Republican attitude is that the United States drove the Spanish out of the islands as a military necessity; that, having done so, it was its duty to assume the responsibility of governing them; and when it has completed the task of civilizing the people, independence will follow. Acting upon this belief, the Republican government inaugurated the tasks of education, sanitation, and unification. They gave to the Filipinos an elective legislative assembly, but placed over it the appointive commission in which Americans were in the majority, so effectively curtailing the actual powers of the people that the phrase "toy government" was in common circulation. The wild tribes were placed under the direct charge of the commission, and the Moros were kept under military domination.

When the Democrats assumed power, in 1913, they gave the Filipinos a majority on the commission, replaced many American civil-service employees by natives, and withdrew the soldiers from the Moro country. They also enacted (1916) the Jones Bill, providing for the Philippines a government modeled after that of the United States, with both legislative houses elected by the people, the American governor to have veto power, and the Supreme Court of the United States to be above the native courts. Under such an act, the relation of the islands to the United States resembles that of Canada to England prior to 1926. The executive power in the islands is administered by a governor-general, named by the President of the United States. The islands have two representatives in the Congress of the United States, with power of debate on subjects relating to the islands, but no vote. All the cabinet members except the secretary of public instruction are Filipinos.

The Jones Bill promises independence after a stable government has been established. Nevertheless, it is said that when the bill passed the Senate, many of the native leaders suddenly realized that complete independence meant helplessness against outside aggression, perhaps inability to resist uprisings of the Moros. In 1922, however, a stronger desire for independence prevailed. President Harding commissioned Major General Wood as governor-general, and during his term, the Filipino independence party was particularly active. Its leaders sent commissioners to Washington who asserted that he was autocratic and encroached upon their constitutional rights, and asked that he be removed. President Coolidge and the Secretary of War upheld the governor-general, and the President stated that the Filipinos showed themselves unprepared for independence by their inability to coöperate

OUTLINE AND QUESTIONS ON THE PHILIPPINE ISLANDS

Outline

I. Position and Size

(1) Latitude, 4° 40′ to 21° 10′ north
(2) Longitude, 116° 40′ to 126° 34′ east
(3) Geographic relation to other lands
(4) Extent
  (a) Number of islands
  (b) Size of chief islands
  (c) Actual total area
  (d) Comparative area

II. Physical Features

(1) Mountainous character
  (a) Volcanic and coral origin
  (b) Highest peaks
(2) Rivers
(3) Extent of coast line

III. Vegetable and Animal Life

(1) Typical tropic vegetation
(2) Economically valuable plants
(3) Differing forms of animal life on different islands
  (a) The carabao

IV. The People

(1) Filipinos
  (a) Origin
  (b) Spanish influence
(2) Other Malay races
  (a) Mountain dwellers
  (b) Moros
(3) Negritos
(4) Dress and living conditions

V. History and Present Status

(1) Coming of the white men
  (a) Discovery by Magellan
  (b) Settlements founded by Spaniards
(2) Spanish rule
  (a) Christianization of natives
  (b) Domination by friars
  (c) Revolt under Rizal
  (d) Rise of Aguinaldo
(3) The American rule
  (a) Battle of Manila Bay
  (b) Cession of islands to United States
  (c) Military rule
  (d) Establishment of civil commission
  (e) Education
  (f) Pacification through road building
  (g) Instilling of ideas of industry
  (h) Sanitation
  (i) Transportation and commerce
  (j) Present form of government
  (k) Question of independence or continued American rule

Questions

Why is it not correct to call all inhabitants of the islands Filipinos? Who are the Moros? The Negritos?

How do some of the Philippine tribes account for the formation of their scattered island country?

What influence has difference in location made in the characters of the Filipinos and some of the mountain-dwelling Malays?

What has always been the attitude of the Filipinos toward manual labor? How has the United States tried to combat this?

What is there in the animal life of the islands which seems to contradict the idea that all the islands were once connected?

On what noteworthy expedition was the discoverer of the Philippines embarked? Where and how did he meet his death?

What event is commemorated in the national holiday of the Philippines?

Who was Aguinaldo, and what part did he play in the history of the islands?

What did the United States pay for the Philippines?

What has to a large extent taken the place of head-hunting among some of the partially civilized tribes?

On what ground are the political parties in the United States divided in their respective attitudes toward American rule in the Philippines?

How has the policy of the American government toward the Filipinos differed from that of most colonizing nations in new colonies?

with the excellent administration of General Wood. Wood returned to the United States in the summer of 1927 to report on Philippine affairs, and to raise a fund of $2,000,000 for the leper colony, but he died before he was able to accomplish his mission.

Persistent demands for independence led President Coolidge in 1926 to investigate the country's condition. The Coolidge policy, based on the report, was to test the capacity of the Filipinos for independence by extending self-government slowly, subject to supervision at Washington. In 1927 Henry L. Stimson, Secretary of War under President Taft, was appointed governor-general. He resigned in 1929 to accept the position of Secretary of State in President Hoover's Cabinet, and was succeeded by Dwight F. Davis, formerly Secretary of War in the Cabinet of President Coolidge.

Related Subjects. The following articles in these volumes contain much information that will be of interest in connection with a study of the Philippines.

HISTORY

Aguinaldo, Emilio	Spanish-American War
Coolidge, Calvin	Taft, William Howard
Dewey, George	Wood, Leonard

LEADING PRODUCTS

Coconut	Rice
Copra	Sugar
Hemp	Tobacco

UNCLASSIFIED

Carabao	Negritos
Igorrote	Pygmies

PHILIPPOPOLIS, *fil ip op' o lis.* See BULGARIA (The Cities).

PHILIP THE BOLD. See BURGUNDY.

PHILISTIA, *fih lis' tih ah,* early name of Palestine (which see).

PHILISTINES, *fil is' tinz,* or *fil' is tinz,* persistent foes of the Israelites in the period of the conquest of Canaan, a mixed people occupying the southern coast of Palestine. They had five fortified cities, Ekron, Ashdod, Gath, Ashkelon, and Gaza. Delilah, the betrayer of Samson, and Goliath, the giant whom David slew, are well-known Bible characters who belonged to this people. Saul and Jonathan were slain in the final triumph of the Philistines over Israel, and the fear with which they were regarded is depicted in David's lament in *II Samuel* 1, 20:

Tell it not in Gath,
Publish it not in the streets of Askelon (Ashkelon);
Lest the daughters of the Philistines rejoice,
Lest the daughters of the uncircumcised triumph.

The yoke of the Philistines was permanently broken in the time of the united kingdom under David.

A Modern Reference. We often hear an uncultured or worldly-minded person referred to as a *Philistine.* The term was popularized in England through Matthew Arnold's use of it in *Culture and Anarchy,* in which he compares people who are opposed or indifferent to culture with the stiff-necked Philistines of the Bible. Before this, in Germany, *Philister* was applied to the working classes who lacked a university education.

PHILLIPS, [CLARENCE] COLES (1885-1927), an American artist, the originator of that type of drawing in which the figure fades away into the background and is caught here and there by means of some accessory or high spot. Most of Phillips' work was along commercial lines, but he injected into his designs the perfection of art and delicacy of treatment which made him outstanding in his field For years, scarcely a magazine of note was issued in the United States without a gem from his pen or brush.



Photo: U & U

COLES PHILLIPS

Born at Springfield, O., he was educated in the public schools of that city. He worked his way through Kenyon College, Gambier, O., until his junior year, when he left to seek his fortune in New York City. Although he had been sketching since early childhood, no one took his flair for drawing seriously. He was self-taught, except for weekly drawing lessons in the grade schools, and his three months' instruction at an art school in New York City, where he studied at night.

His first work in painting was done in the advertising department of a cloak and suit house. Then he joined an advertising agency, where he mastered the technical end of the business and learned that he could sell his ideas. As an advertising salesman, Phillips cultivated a keen business sense, which he utilized later to a good advantage in an organization of his own. But the urge to get into the magazine field was too strong to go unheeded any longer, so he gave up a lucrative business and rented a humble studio. His first drawing was accepted by *Life* and used as a center spread. Thereafter, he became a regular contributor to its pages. He first created his fadeaway pictures as color covers for this periodical, and the "Fadeaway Girl" was an instantaneous success. He enjoyed doing other subjects, but editors preferred his drawings of girls, and his fame became identified with them. He did commercial art work for an enviable list of outstanding magazines, jacket covers for books, book illustrations, and cover designs.

For a number of years, Phillips lived at New Rochelle, a suburb of New York City. Here, in a studio overlooking Long Island Sound,

with his wife as model, he did his best work. He died after an illness of almost a year, a part of the time being spent in Switzerland in search of health.

PHILLIPS, DAVID GRAHAM (1867-1911), an American novelist, born in Madison, Ind. He was graduated at Princeton University in 1887, and began his literary career as a reporter and newspaper correspondent. For a time he was on the editorial staff of the New York *World*. In 1901 he published his first novel, *The Great God Success*, and during the next ten years, he wrote a long list of novels, all of which revealed a gift for telling a story interestingly; at the same time, he introduced ethical and social questions that stimulated his readers to thought. At the height of his career, Phillips was shot to death by an insane person.



Photo. Brown Bros

DAVID GRAHAM PHILLIPS

His Writings. Among these are *The Husband's Story*, *The Second Generation*, *Old Wives for New*, *The Fortune Hunter*, *The Hungry Heart*, and *The Grain of Dust*. His last book—*Susan Lenox*—was in manuscript form at the time of his death, and was first published in a magazine in 1916.

PHILLIPS, WENDELL (1811-1884), an American orator and reformer, one of the radical leaders of the anti-slavery movement. He was born in Boston and educated at Harvard University. After studying law for three years, he became so interested in the slavery agitation that he neglected his profession. The sight of William Lloyd Garrison dragged at a rope's end by a Boston mob in 1835 determined his future career, for early the next year he joined the abolitionists and became a zealous worker in the American Anti-Slavery Society.



Photo. Brown Bros

WENDELL PHILLIPS

In 1837, at a meeting called in Faneuil Hall to protest against the murder of the Rev. E. P. Lovejoy, an anti-slavery advocate, at Alton, Ill., he delivered an address which many critics consider the equal of Patrick Henry's Williamsburg oration, and to approach closely the sublimity of Lincoln's Gettysburg Address. Henceforth Phillips was looked upon as a leader in the reform movement, but his extremely radical views frequently repelled other leaders. He refused to take the attorney's oath to the Constitution, denounced Congressmen for swearing allegiance to it, and declared the Church an accomplice in crime for justifying slavery by the Bible. He even refused to vote, and demanded immediate abolition or disunion. Even when the War of Secession had ended, he refused to allow the dissolution of the Anti-Slavery Society until the negro had obtained suffrage, and did not cease this agitation until the passage of the Fifteenth Amendment, in 1870.

He had then been in reforming activities so long that he could turn his mind to no other task, and therefore devoted his energies to a multitude of public questions, such as prison and labor reform, woman's rights, the abolition of capital punishment, prohibition, justice to the Indian, etc. In the use of wit, invective, epigram, and apt illustration, Phillips had few equals among American orators.

PHILLIPSBURG, N. J. See NEW JERSEY (back of map).

PHILLPOTTS, EDEN (1862-), an English novelist whose works reveal his deep interest in and sympathetic understanding of humanity. His strength lies in the primitive simplicity of his characters. Questionings and doubts disturb their peace of mind, leaving them at a disadvantage in their attempts to meet life's puzzling ethical problems. Phillpotts was born at Mount Aboo, India, his father having been an officer in the British army. Educated at Plymouth, he worked there as a clerk in an insurance office from the age of eighteen until he was twenty-eight. He then went to London to study for the stage, but his progress as an actor was slow and uncertain, so he turned to writing as his life work. He has attained high rank among contemporary English novelists. In much the same way that Thomas Hardy is the exponent of the life of Wessex, Phillpotts is identified with the country life of Devonshire. Like Hardy, his settings are colorful and his plots tragic; but, unlike Hardy, his characters suggest a general rather than an individual type, created to proclaim his philosophy.

Characteristic Works. The first book to give Phillpotts the definite recognition of English and American readers was *Lying Prophets*, published in 1897, with its setting in Cornwall instead of Devonshire, with which his name later became associated. This book proves him as skilled a painter of marine landscape as he is of mountain and moor. Subsequently, he wrote a great number of novels, books of plays, and poems. Foremost among his other novels are *Children of the Mist*, *Sons of the Morning*, *The River*, *The Secret Woman*, *Old Delabole*, *The*

Mother of the Man, *The Three Brothers*, *Jig-Saw*, and *The Jury*. The last-named, published in 1927, is the story of a jury trying to reach a decision while locked in the jury room.

His volumes of plays include *The Shadow*, *Curtain Raisers* (short plays), *The Farmer's Wife*, *Three Short Plays*, and *Saint George and the Dragon*. Among his books of verse are *Iscariot*, *Plain Song*, *As the Wind Blows*, and *A Harvesting*. Under the *nom de plume* of Harrington Hext, he published *Who Killed Cock Robin?* and *The Thing at Their Heels*.

PHILOLOGY, *fih lol' o jie*, is the study of language in a scientific manner, not merely to learn its content or the correct method of using it (see GRAMMAR), but with a view to tracing its historical development and shedding light on the history of the peoples among whom it grew up. Philology investigates the laws governing the speech of all human beings of all times, and employs other sciences, particularly psychology, in order to make clear the development of languages.

Growth of the Science. In its most common present-day application to a comparative study of related languages, with a view to discovering their original connection and their gradual divergence, the word *philology* has been used less than a century and a half; for before the latter half of the eighteenth century, such a thing as a common stock for languages which apparently had no linguistic relation was unthought of. Philology is an outgrowth of the literary study of Greek and Latin. It was only with the discovery of Sanskrit and of its connection with Greek and Latin that comparative philology began.

After the first suggestions of the possible relations of languages were made, scholars of every nationality took up the study; it was pursued so scientifically that definite laws were discovered, according to which it was shown how various branches of common origin had grown away from each other. Most attention has been given to the Indo-European family of languages (see ARYAN), which includes Sanskrit, Persian, Greek, Latin, and its derived Romance languages, as well as German, English, and Norse, but the early idea that all other groups of languages could be judged by the history of this group is no longer tenable.

Not One Original Language. The beginnings of speech between human beings, so far as they are known, are discussed in the article LANGUAGE. The old theory that all languages of the world had been derived from one common tongue, and that this could be restored by isolating the elements, or *roots*, common to all languages, proved to be a futile hope. Scholars are to-day practically agreed that the various highly developed languages of the world are not the outgrowth of a single primitive speech. Not only in vocabulary, but in principles of formation, various languages differ so utterly that it is evident they belong to several groups, or families. Within these groups, of which the most important to Europeans and Americans is the Indo-European, there are subdivisions, based on the principles according to which words and sentences are formed. Thus there are the so-called *isolating* languages, of which Chinese is the most conspicuous example, which show a total lack of inflection, using roots of one syllable which are never placed in combination; the *agglutinative* (which means *running together* or *adhesive*), represented by Turkish, which permit of the combination into one word of a number of separate words, which keep their original meaning and usually their original form; and the *inflectional* class, in which prefixes and suffixes, originally separate words, have lost their identity and become mere inflections. Many of the languages of Europe and the English are changing from the inflectional group to the *analytical* class, which has a tendency to drop inflections and make use of auxiliary words. This approaches again the *isolating*, or *monosyllabic*, class and gives support to the theory that languages like Chinese are the results of a long history of gradual simplification, from a complex primitive tongue to their monosyllabic speech of to-day. Scholars claim that all languages are undergoing this change, which accounts for the shift from an inflectional to an analytic language.

Where It Meets Popular Interests. Much that has been discovered by philologists, aside from the general relationships outlined above, is too technical to be of interest to any save scholars. In its narrower sense, however, philology presents word histories which cannot fail to interest anyone who will take the trouble to look them up.

The development of the meaning of the word *philology* itself is an interesting example of word history. Compounded of two Greek words signifying *love* and *word*, it at first denoted a mere "fondness for words"; that is, a philologist was a "talkative person." The change to the present sense has been very gradual.

The word *lunatic*, another instance, acquires new meaning if its derivation from the Latin word *luna* is known, for *luna* means *moon*, and the ancients believed that lunacy was governed by changes of the moon, or even caused by bright moonlight. To this day, many a superstitious person will not sleep where the moonlight strikes his head or face.

The word *character* is used in two ways which at first seem totally different. It means a graphic symbol of any sort, as a letter, a figure, going back through the Latin to the original Greek word, which meant *to cut into furrows*, *to engrave*, *to mark*; but it also means the "sum of qualities or features by which a person or a thing is distinguished from others." The connection is not immediately obvious, but a

little study shows that this derived meaning refers simply to the stamp or "character" impressed by nature, education, or habit.

Manufacture, which has come to have almost exclusively the meaning of producing by means of machinery, is composed of two Latin words, practically unchanged in form, which mean *a making by hand*.

It is possible to multiply such instances in nearly endless number, but the student will find pleasure in tracing them for himself. Any good unabridged dictionary gives such derivations, tracing them in some instances through various languages before they emerge as modern English words. And even in English itself many words have had a curious and interesting history. Some have become obsolete altogether, some have acquired new meanings which differ widely from the original one. Only with a knowledge of philology in this sense does one acquire the ability to use with precision the words of the English language.

Related Subjects. The reader is referred in these volumes to the following articles

English Language
French Language
German Language
Greek Language
Hebrew Language and Literature
Italian Language and Literature
Language (Origin of Language)
Languages of the World
Latin Language
Sanskrit Language and Literature

PHILO, *fi' lo*, **OF BYZANTIUM,** *bih zan'-shi um*, compiler of the second list of the seven wonders of the world (which see).

PHILOSOPHER'S, *fil os' o furz*, **STONE.** See ALCHEMY.

PHILOSOPHY, the study of the mental and moral sciences. The word itself means *love of wisdom*, but it has varied in meaning from age to age. Essentially, the fundamental concern of philosophy has been to find the ultimate meaning of the universe, to discover the causes, reasons, powers, and laws of all phenomena. Thus it is distinguished from exact science, in dealing with interpretations rather than with facts. Pure science discovers and classifies phenomena; philosophy gives perspective and valuation to them.

According to modern usage, the term includes five fields of investigation: logic, esthetics, ethics, politics, and metaphysics. The chief characteristic of these topics, except the last, is that they deal with aims or ends to be achieved: logic, with ideal thought method; esthetics, with ideal form; ethics, with ideal conduct; politics, with the ideal State; and metaphysics, with the nature of mind and matter, and the interrelations between them. It is only in comparatively recent times that the domain of philosophy has been thus definitely marked out. To the ancient Greeks it stood for general culture, "all knowledge." But that was before scientific research had so broadened the realms of knowledge as to make classification necessary. To-day, various special sciences include much of the knowledge that was originally within the scope of philosophy.

Greek Philosophy. The earliest philosopher on record is the Greek Thales, who founded what is known as the Ionic school, as long ago as 600 B.C. He made the first attempt, so far as is known, to get away from the mythological explanation of the universe. The first philosophers considered mind and thought but little; their chief subjects of speculation were physical phenomena and the real nature of matter. They developed various systems of natural philosophy, which were ridiculed and criticized by the skeptical *Sophists*, a school which sprang up at the close of this "pre-Socratic" period.

It was Socrates who, as Cicero said, "brought down philosophy from the heavens to earth." He was a *moral* philosopher; that is, the aim of his teachings was to help men to live better lives His influence led to the founding of many other schools of Greek thought; among these were the *Cynic* and the *Cyrenaic*, forerunners of the *Stoic* and *Epicurean* schools, developing the practical side of his teachings; the *Academic*, founded by Plato; and the *Peripatetic*, founded by Aristotle, developing the idealistic side. The next important phase was that of *skepticism*, a philosophy which, like that of the Sophists, was largely one of denial.

Roman Philosophy. The Romans did not develop any original system, but borrowed from the Greeks. Their characteristic school was the *Eclectic*, represented by Cicero; it was a patchwork of doctrines from Stoicism and other Greek systems, and from Aristotle. A system that originated in Alexandria and spread to Rome and Greece was *Neo-Platonism*, which was a mixture of Christianity and Greek and Oriental philosophy.

Medieval Philosophy. The Middle Ages produced the philosophic system called *Scholasticism*, an application of Aristotle's logic to the basic Christian doctrines. Anselm, Abelard, Saint Thomas Aquinas, and Duns Scotus were among the famous teachers and writers of the Scholastic school.

Beginnings of the New Philosophy. Bacon and Descartes are looked upon as the founders of modern philosophy. Bacon, following a path which Aristotle had partly marked out, established a system which has had a marked effect on scientific research—a plan of reasoning which leads from the known to the unknown, beginning with facts and proceeding through investigation and experiment to general truths. Descartes, on the other hand, believed in reasoning from the unknown to the known; in other words, starting with laws reached through thought, and from there proceeding to individual facts.

Modern Philosophy. Present-day thinkers have merely elaborated or modified the older systems, giving them the more practical application which scientific progress has made natural. Among the foremost modern philosophers may be mentioned Hegel, Kant, Herbart, Lotze, Nietzsche, and Schopenhauer in Germany; Herbert Spencer, Darwin, John Stuart Mill (see UTILITARIANISM), Locke, and Hume, in England; Cousin, Voltaire, and Bergson, in France; and Jonathan Edwards, Emerson, William James, Dewey, and George Santayana in the United States.

It cannot be said that America has as yet contributed any unique system of philosophy to the world's thought But the writers named above have performed valuable service in supplying new ways of looking at old truths, or rather, in giving new emphasis to certain aspects of truth.

One of the early enterprises which gained a considerable following among the people of New England was the Transcendentalist Club founded by Emerson about the middle of the nineteenth century Its principal tenets were insistence on the worth of the individual, and refusal to adopt the formalism which characterized the religious and scientific thought of the day. Its philosophy was mainly borrowed from Germany and France, but the application of it was suited to the needs of a young nation rich in opportunity and optimism.

Another contributor was William James, who formulated the philosophy of pragmatism. This doctrine, too, was appropriate to a new and vigorous nation. It combined the realistic view point of the pioneer with a proper respect for the essentials in traditional beliefs. James did not claim originality for his theory, but modestly said that it was "a new name for old ways of thinking."

Probably the most typically American expression will be found in the writings of John Dewey. His philosophy may be described as a sound and simple naturalism. The chief problems are those of the organization of a just social order. The first step is the recognition of mind and life in biological terms, as an organ in an environment, acting and acted upon. According to this view, modes of response are more important than states of consciousness. "The brain is primarily an organ of a certain kind of behavior, not of knowing the world." Thought is an instrument of adjustment, not merely of cognition. The thing needed is not so much to know the external world as to learn how certain values may become actual in life "Physical science has for the time being far outrun psychical; . . . with tremendous increase in our control of nature, in our ability to utilize nature for human use and satisfaction, we find the actual realization of ends, the enjoyment of values, growing unassured and precarious." The solution is for philosophy to use the new scientific methods to discover ways by which all men and women may participate to the fullest extent in all attained values. "The task of future philosophy is to clarify men's ideas as to the social and moral strifes of their own day. Its aim is to become, so far as is humanly possible, an organ for dealing with these conflicts " E.U.G.

Related Subjects. The reader will find more detailed treatment of the various phases of philosophy and its closely connected subjects in the following articles in these volumes

Agnostic	Metaphysics
Altruism	Mysticism
Asceticism	Optimism
Cynic School of Philosophy	Pantheism
Deductive Method	Pessimism
Esthetics	Pragmatism
Ethics	Psychology
Fallacy	Rationalism
Fatalism	Scholasticism
Generalization	Sophists
Inductive Method	Stoicism
Logic	Transcendentalism
Materialism	Transmigration of the Soul
Mechanism	Utilitarianism

These volumes also contain articles on the following distinguished philosophers

Abelard, Pierre	James, William
Aristotle	Kant, Immanuel
Aurelius, Marcus	Leibnitz, Baron von
Bacon, Francis	Locke, John
Bacon, Roger	Mill, James
Bergson, Henri L	Mill, John Stuart
Comte, Isidore Auguste	Newton, Sir Isaac
Darwin, Charles R	Nietzsche, Frederick
Descartes, René	Pascal, Blaise
Dewey, John	Plato
Diogenes	Pythagoras
Edwards, Jonathan	Schopenhauer, Arthur
Emerson, Ralph Waldo	Seneca, Lucius Annaeus
Epictetus	Socrates
Epicurus	Spencer, Herbert
Fichte, Johann Gottlieb	Spinoza, Baruch
Hegel, Georg W F	Strauss, David Friedrich
Herbart, Johann Friedrich	Thales
Hobbes, Thomas	Theophrastus
Hume, David	Voltaire
Hypatia	Zeno

PHLEGETHON, *fleg' e thon*, in mythology, the river leading to eternal torment. See FURIES, TARTARUS

PHLOX, *floks*. The brilliantly colored scarlet blossoms characteristic of many species of phlox are said to have given these flowers their name, which comes to us from the Greek for *flame*. In spite of their range of showy colors, however, the phlox blossoms are never flame-colored. This genus of flowering herbs is native to North America. Because of their hardiness and ease of growth in fertile soil, phlox plants are favorites in the home garden, and many different varieties have been developed by breeding. All annual varieties are derived from *Drummond's phlox*, a species that originally grew wild in Texas. The flowers show a wonderful range of color—creamy

white, pale yellow, deep pink, salmon-pink, magenta, purple, lilac, and crimson—and many are star-shaped. The familiar wild *sweet William*, whose bluish or pale-lilac flowers are among the early-summer blossoms,



Photo Keystone

When May, with cowslip-braided locks,
Walks through the land in green attire,
Then burns in meadow grass the phlox
His torch of purple fire
—BAYARD TAYLOR

also belongs to the phlox group. Annual varieties of phlox are grown from seeds, the perennials from seeds and from stem and root cuttings. See ANNUALS; PERENNIALS.

Scientific Names. The phlox genus belongs to the family *Polemoniaceae*. Drummond's phlox is *Phlox drummondii*. The wild sweet William is *P. maculata*. B.M.D.

PHOCION, *fo' shih on* (about 402-317 B.C.), an Athenian general and statesman, famed as the opponent of Demosthenes (which see). In his youth he was a pupil of Plato. He first came into prominence in 376 B.C., when he held a subordinate command at the important Battle of Naxos, and by the middle of the fourth century B.C., he had become one of the foremost men in Athens. The great question before the Athenian people at that time was that of the relation between Macedon and the other Greek states; Demosthenes and other orators thundered against Philip of Macedon and urged Athens to resist him at any cost (see PHILIP II); Phocion, fully as patriotic, felt that resistance to the strong power of Macedon would be useless and disastrous, but was never able to convince the people of the wisdom of his point of view. Several times he was successful in battle against Philip, and was always able to make better terms with the Macedonians when they were victorious than anyone else could have done.

In his old age, Phocion became involved in political intrigues which compelled him to take refuge among the Phocians. They, however, delivered him up to the Athenians, who forced him to drink poison. Not long afterward, the public temper having changed, a statue was raised in his honor, and public funeral services were held for him.

PHOCIS, *fo' sis*, an ancient district in Central Greece. See map, page 1677.

PHOEBE, *fe' be*, a small grayish-brown bird of the flycatcher family, common throughout Eastern North America in summer, and migrating in winter to the Gulf states and Mexico. In Canada it is found in the neighborhood of Montreal and westward to West Ontario. It takes its name from its monotonous call, "pewit, phoebe; phoebe, pewit," continuously repeated, as it flies about in search of a habitation. It stays about houses and barns, often



Photo Visual Education Service

THE PHOEBE

returning spring after spring to the same yard to nest on rafters or beams. It is also fond of building under bridges and under cliffs near small waterfalls; in the northern forests, almost every cabin and logging camp harbors a pair of phoebes. The nest is built of moss and mud and lined with grasses and long hairs. The eggs are four to seven in number, and are white in color, sometimes spotted with cinnamon. The phoebe preys on insects, which it captures while it is on the wing, and it is therefore of benefit to farmers.



WHAT THE PHOEBE EATS

Say's phoebe is a species found west of the Rocky Mountains. The common phoebe is also known as *pewee* and as *pewit*. D.L.

Scientific Names. The phoebes belong to the family *Tyrannidae*. The common phoebe is *Sayornis phoebe*; Say's phoebe is *S. saya*.

PHOENICIA, *fe nish' ih ah,* the first really great commercial power among nations, was a part of the land of Canaan of the Old Testament. Nobody knows when it had its beginnings, but by 1500 B.C. it had had a fairly long history, and its cities then were large and prosperous. It was situated on the extreme eastern Mediterranean shore, extending from the Eleutherus in the north to Mount Carmel in the south, a distance of nearly 200 miles. On the east were the mountains of Lebanon, whence came the famous "cedars of Lebanon." The actual boundaries of this country are as uncertain as its early history, but its influence was greater than that of any contemporary power. Phoenicia had practically no natural advantages, being merely a narrow strip of land hemmed in by mountain, desert, and sea, surrounded on the landward side by warlike and hostile tribes; the people were almost literally pushed off to sea in order to make a living.

Achievements of the Phoenicians. It has always been maintained that the Jews were not fond of the sea; yet the inhabitants of Phoenicia were of Semitic origin and became the leading maritime power of the world. They were not a warlike race, but they created a great naval power to protect their commerce, sea-borne to the uttermost parts of the world, as it was then known. Their vessels, which sought out every available trading post in the Mediterranean, even passed the Strait of Gibraltar, sailing north and returning laden with tin from the mines of Cornwall, England. Caravan routes brought perfumes and spices from the Far East, and gold, pearls, and frankincense from Arabia; and in addition to these articles, the Phoenicians traded in silver from Spain; slaves, ivory, and skins from Africa; linen from Egypt; copper from Cyprus; purple dye from the celebrated purple fish from Tyre; and ingeniously wrought silver and brazen vessels from Sidon. While the sailors of other nations posted the information, *Ne plus ultra* ("no more beyond") on the promontory at the western end of the Mediterranean, fearing to venture farther because of the monsters of the unknown deep, the fearless Phoenician merchantmen defied the warning and forged ahead, thus extending the boundaries of the world, as it were. But always with an eye to monopoly, they concealed their routes and their knowledge of winds and currents.



LOCATION MAP
The black area bordering the sea was old Phoenicia.
(*a*) Land of the Hittites (*b*) Syria (*c*) Israel (*d*) Philistia (*e*) Judah (*f*) Moab (*g*) Ammon

Wherever they went, they established colonies for trading purposes, forming seats of commerce on Cyprus, the southern coast of Asia Minor, Southern Spain, Sicily, Sardinia, and the northern coast of Africa. Chief among these trading centers was Carthage, destined later to dispute with Rome the mastery of the world.

Adopting and improving upon the arts, culture, and industries of these many peoples with whom they traded, the Phoenicians became the center of dissemination of a vast amount of knowledge. They were noted for their textiles and methods of dyeing, for their metal work in gold and silver and copper, for their glasswork, for their mining industries and skill in building, for their sculpture and inscriptions, for their tombs and temples. They are remembered to-day chiefly for their invention of an alphabet.

Their Religion. Like the Assyrians, the Phoenicians adhered to a religion which was cruel and debasing. Their gods were formerly mere earthly people who were gradually given heavenly attributes. Their worship represents the animistic stage in the development of religion, and fertile fields, trees, mountains, rivers, etc., were thought to be of sacred import. Being great travelers, the Phoenicians borrowed ideas and practices from the worship of many nations.

Baal, the sun god, was supposed to delight in human offerings, and to him, in times of national calamity, it was customary to sacrifice every first-born child. There was, however, no one particular Baal, each city having its chief deity called by the name Baal, who was responsible for the fertility of the soil and for the general prosperity of the city. Astarte, the moon goddess, was also the goddess of love. She was the Phoenician form of Aphrodite and Venus, and was identical with them. The worship of Astarte was conducted with revolting rites of debauchery. The Moloch of the Old Testament was, in Phoenicia, the god Milk, who took particular pleasure in the sacrifice of infants by burning. Of mighty temples, built with years of sacrificing labor, few traces remain. Of the great sanctuary of the Baal of Tyre, not a sign can be discovered.

Decline. Politically, Phoenicia had little power or ambition, and in time submitted to more powerful neighbors. Its cities and its



navy, however, made it indispensable in the scheme of world politics, and though, after 850 B.C., Phoenicia became tributary in turn to Assyria, Babylonia, Persia, Egypt, Greece, and Rome, its position was more that of a helpful ally than of a subject state. Until its conquest by Alexander the Great, in 332 B.C., it maintained its commercial supremacy. Phoenician power then began to wane, and under the Roman rule after 64 B.C., as a part of Syria, the country lost its identity forever.

Of the once famous "cedars of Lebanon" that crowned the slopes of the northern boundary, few remain. The land there lies desolate. It was from Hiram, king of Tyre, that King Solomon obtained the cedar needed to build the Temple, and the artisans required for the work, for he had none with "skill to hew timber like unto the Sidonians."

Cities. Tyre and Sidon, each a magnificent city with a fine harbor, formed the centers of Phoenician commerce, manufacture, and art, Tyre as the great colonizing power, Sidon as the commercial and manufacturing center. Though the cities were built originally on islands, the ancient sites are now connected with the mainland, and their harbors are no longer deep enough for ships of commerce. The ancient city of Beirut is the present seaport of the district originally Phoenicia.

Sidon, *sī' dun,* was situated on the Mediterranean shore. At various times it held the supreme place in the Phoenician confederacy, alternating with Tyre in this rôle Sidon was famed for its purple dyes, and its people, who are mentioned in Homer's writings, were skilled traders and artisans There is a tradition that they manufactured glass from the fine sand of the Belus River, and Pliny credited them with the discovery of the process A number of magnificent sarcophagi have been found in the vicinity. Luxurious fruit gardens now cover the ancient site of Sidon The modern town of Saida, a place of about 12,000 people, occupies a portion of the site. Protestant and Roman Catholic missions are maintained here.

Tyre, *tīre,* was located twenty-four miles southwest of Sidon, its rival in commercial and political importance The original city was built on a small island three-fourths of a mile from the mainland. When, in 332 B C, Alexander the Great carried on a famous siege of the city, he constructed a causeway joining the island and the mainland, and this ancient structure, widened by deposits of sand, has transformed the island into a peninsula. The small, unimportant town of Sur, built about a harbor at the north end, is the modern representative of old Tyre, which, in the Roman period, occupied both the island and a strip along the mainland and had a population five times that of the present town.

Centuries before the birth of Christ, Tyre was one of the greatest maritime cities of the world, and Tyrian colonists founded Gades (Cadiz), in Spain, and Carthage, in Northern Africa. The mother city in this period was widely known for its purple dyes and glassware. During the Roman period, it was a center of learning and possessed a great university, and in later years, it revived as an industrial center

The Crusaders captured it in 1124. Tyre remained under Christian domination until 1291, but in that year it was destroyed by the Moslems The present town of Sur, which has about 6,500 inhabitants, dates from the eighteenth century.

Related Subjects. The reader who is interested in Phoenicia is referred in these volumes to the following articles

Acre	Cedar (subhead)
Alphabet	Lebanon, Mountains of
Baal	Solomon
Carthage	Syria (Cities)

PHOENIX, *fe' niks,* a bird famed in fable, held sacred by the Egyptians and said by Herodotus, the "father of history," to have come to Egypt every 500 years from Arabia. It was supposed to have red and golden plumage and to resemble the eagle in size and form.

Of the many fanciful tales related of the phoenix, perhaps the best-known is the one connected with its death. It was said to reach the age of about 500 years, and when ready to die, it built itself a nest of herbs, lighted it by fanning with its golden wings, and used this nest as its pyre. From the ashes a worm was generated, whence grew the young phoenix. Pliny declared it to have been the belief that there was but one phoenix on earth at a time, and when it died upon the pyre it had erected, the worm which developed from the ashes became, in its turn, the only representative of the species. Another legend tells of the sweet song of the phoenix, sung at the rising of the sun.

Modern Reference. The modern use of the word is based upon these old legends When a new building is at once erected upon the ruins of one destroyed by fire, it is said to "rise phoenix-like from its ashes."

PHOENIX, Ariz. See Arizona (back of map).

PHOENIXVILLE, Pa. See Pennsylvania (back of map).

PHONEIDOSCOPE, *fo ni' do skope* See Stethoscope.

PHONETICS, *fo net' iks,* the science of the sounds of speech and their representation by alphabetic characters. It concerns itself at the outset with the vocal organs and their relations to each other, whereby articulate speech is produced, with the resonance cavities of larynx, pharynx, nasal passages, and mouth, and the effect produced by them on the air expelled from the lungs. Many sounds which to the casual observer seem identical are shown by such close study to differ in their method of production and hence in their actual phonetic value.

Phonetics have a practical value in the learning of a new language; for the surest way of acquiring the correct pronunciation of sounds in a foreign language which differ from those in the native tongue is to ascertain and exactly reproduce the relative positions of the vocal organs. Without the knowledge of phonetics, too, people born deaf and dumb could never be taught articulate speech.

The Phonetic Ideal. A detailed technical discussion of the speech sounds of the English language with their phonetic values is beyond the scope of this article, but there are certain general facts which are worth the attention of anyone interested in the study of languages. The phonetic ideal is an alphabet which has a symbol for every sound used in the language, and no unnecessary symbols. Perhaps there has never been an alphabet which fulfilled these conditions; surely there is none to-day.

Sounds are too variable for a purely phonetic alphabet to remain unchanged, and if the ideal phonetic language were established, it would probably not remain ideal in its ability to express all sounds. The difference between sound and symbol results from the change in the pronunciation of words for which the original phonetic spellings have been retained. In the time of Chaucer, *knight* was pronounced just as it is spelled, the *gh* having the sound of *ch.* Some languages are far more nearly phonetic than others; thus the Spanish has very few exceptions to its sound system, and the German is a close second. In German, almost every letter of the alphabet has but one sound, and there are few silent letters in words, practically all exceptions being covered by a few definite rules.

Phonetic Weakness of English. With English, however, the case is quite different. With the possible exception of French, no other language equals it in irregularities and arbitrary distinctions. English speech calls for certain sounds which the Latin people did not use, and for these the Latin alphabet, adopted almost without a change, afforded no symbols. In many instances, too, pronunciations have changed, and words which were formerly phonetic are now distinctly not so. How far the English alphabet fails of being a perfect phonetic medium may be seen by an examination of letters *A, E, I, O, U, C, G, J,* and *S,* and their sounds. Each of the vowels is forced to do duty for several sounds, the first for no fewer than eight; and occasionally these sounds overlap, or duplicate the pronunciation of certain diphthongs; *C* is an unnecessary letter, except in such combinations as *ch,* for one of its values is equally well represented by *k,* the other by *s.* These facts, taken in conjunction with the very frequent silent letters, show why English is so difficult a language for a foreigner to master.

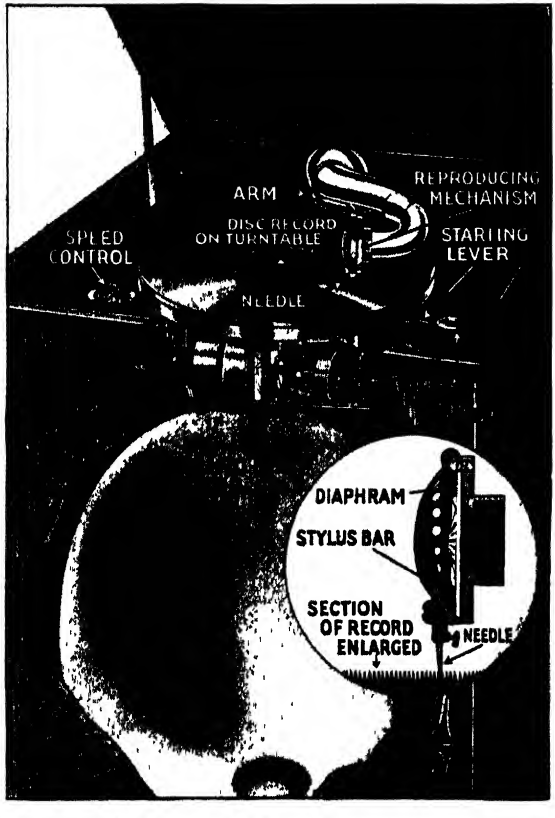
Why Reform Is Slow. A number of attempts have been made to reduce English to a really phonetic basis. Phonetic alphabets, wherein each sign represents, wherever it is found, one definite sound value, have been suggested by various scholars, the English alphabet being taken as a base, with such additions and subtractions as were absolutely necessary. Attempts at spelling reform in the direction of phonetic spelling have made some headway.

They are discussed in the article SPELLING (Simplified Spelling). Strangely, the chief argument against all attempts at reform is the very need for them: if phonetic divergences were less common, they might be corrected and yet leave the language practically as it stands; but a wholesale sweeping away of all the irregularities would render all previously written books almost as difficult for the uninitiated reader as if they were in a foreign language. There are a number of standard notations and markings used to give the approximate values of both vowels and consonants, and these are used in dictionaries and encyclopedias to assist in pronunciation, and to show phonetic values of letters.

Related Subjects. The reader is referred in these volumes to the following articles

Deaf and Dumb (The Education of Deaf-Mutes)
English Language
Orthography
Voice

PHONOGRAPH, *fo' no graf,* a device for recording and reproducing sound, including human speech. Within a few years after its invention, the phonograph advanced from the status of a plaything to a place of real importance in the world's progress. It would merit a place in every home if its only mission were to furnish wholesome entertainment, but, like the moving picture, it is destined to be linked with history, with art, with music, for all time to come.



MECHANISM OF A MODERN PHONOGRAPH

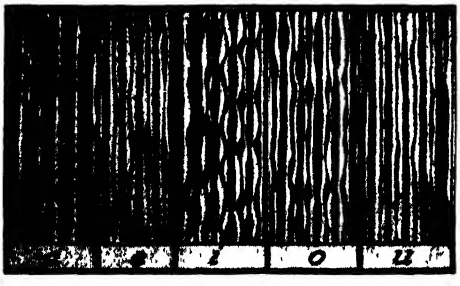
If every school child could to-day hear the voice of Abraham Lincoln delivering the imperishable 267 words of the Gettysburg Address, and on the moving-picture screen see him stand as on that occasion; could they hear the voice of Jenny Lind as their grandfathers heard it; could they hear the quieting words of Garfield, "God reigns, and the government at Washington still lives," uttered in New York the day after Lincoln's death; could they listen to the voice of Washington as he gave his country sage counsel in his Farewell Address; could British children hear to-day the ringing tones of Fox, Burke, Disraeli, Gladstone; could there be chosen from a thousand "records" the spoken words which marked an epoch or decided great destinies, the past would possess a significance that the printed page never can give it. "You may fire when ready, Gridley," proclaimed preparedness, but we would experience a greater thrill of pride if we could hear the calm, unimpassioned, confident voice of Dewey on that May morning in Manila Bay.

Children a hundred years from now are to have rich experiences, because with the talking machine and the moving picture they are actually to hear things and see things which made history before they were born. They may hear the voice of Woodrow Wilson appealing to Congress for war in 1917; they will see in moving pictures the nation-wide response to that appeal. They will read in the books of that day of statesmen rising to oratorical heights in great crises, and will hear from the "records" those impassioned utterances. There will be great singers in that day, but probably few greater than Caruso, Melba, Homer, and others of their generations, and these will live then, as now, in the perfect talking-machine record. Sarah Bernhardt rejoiced when she was asked to present a play for the moving pictures, for, she said, "Now I shall live a thousand years." Her voice will also as long delight her countrymen and lovers of her supreme art everywhere, for she has spoken her "lines" into the "records."

Furthermore, the talking machine is going to preserve spoken languages that are dying out, and also the present-day speech and folklore of American Indians. Students of foreign languages are aided in the mastery of pronuncia-

tion by "records" made for the purpose. The talking machine has entered the business world; the business man dictates his letters into the machine, and later the typist listens and writes.

Development of the Phonograph. Thomas A. Edison (which see) was the pioneer in the development of a practical talking machine, though the basic idea did not originate with him. In 1877 he brought out the first phonograph, which, as later perfected, operates on the following plan: Impressions of the sounds to be recorded are made on a wax-covered cylinder which revolves against a sharp needle



THE RECORD OF A TENOR VOICE

Part of a record, as seen through a powerful microscope The differences in the curves show the differing indentations made in singing the vowel sounds In reproducing these sounds, the needle passes over these indentations and vibrates exactly as did the stylus which made the curves

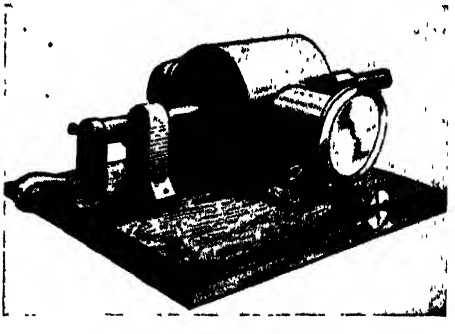
point, or stylus, attached to a thin metallic diaphragm. The diaphragm, which is mounted on a carriage, is set in motion by the impulses of the voice or mechanism producing the sounds, and as it vibrates, the stylus cuts into the wax small indentations or grooves, which travel in a spiral around the entire length of the cylinder. The reproduction of the sounds is accomplished through the medium of another diaphragm carrying a needle which follows the grooves already made in the wax. In the earlier type of talking machine, the sounds were reinforced by means of a trumpet-shaped horn; at a later date, the horn was so designed that it could be built into a cabinet.

The original Edison machine was provided with a cylinder covered with tin foil; the wax cylinder was the invention of Chichester A. Bell and Charles S. Tainter, who brought out the so-called *graphophone* in 1885. The graphophone, in brief, was the first phonograph in which a wax cylinder was used. In 1887 appeared the *gramophone*, the invention of Émile Berliner (which see). This instrument made use of a disk instead of a cylinder, while the stylus cut on the disk a zigzag groove of the same depth throughout, instead of one of varying depth. Almost all of the modern talking machines are patented forms of the original Berliner instrument. Though the first Edison machines were provided only with cylinder records, both cylinder and disk models are now manufactured by the Edison Company, the cylinder type being used in dictating machines. The present practice is to designate a talking machine, whether of the cylinder or disk type, by its special trade name.

The Electric Phonograph. The mechanical system of recording and reproduction described above was subject to serious limitations. Some tones were reproduced much more clearly than others; the range of notes that could be effectively reproduced was only about three and a half octaves; and the scratching sound made by the needle was always present. These objections have all been removed by the new electrical system of recording and reproduction.

This system utilizes a vacuum-tube amplifier to increase the power of the vibrations of the recording needle The vibrations of the diaphragm which receives the sound waves produce a constantly varying electrical voltage which is amplified by the vacuum-tube apparatus and transmitted to the recording needle. This ensures a maximum faithfulness in the recording of the initial sound waves. In reproducing the sound, the process is reversed. The vibrations of the needle on the record produce an electrical voltage which is amplified by the vacuum-tube amplifier and then converted into sound by a loud speaker.

One of the advantages of the new method of recording is that the performers are freed from the necessity of regulating the volume of the tones to be recorded. In making the old-type records, players were obliged to be closely



THE FIRST TALKING MACHINE

The original Edison machine, invented in 1877.

crowded together in front of a horn into which the sound must be directed. Some instruments had to be played softly in order not to drown out others. With the modern method, one or more microphones are used, and the players may perform in their usual way. The microphones will blend the tones and give the proper effect, even of a large symphony orchestra.

Another gain accomplished by the electrical system is the elimination of the scratching noise of the needle. This is done by means of

an electric-filter circuit so tuned that it eliminates the frequencies in the vicinity of the objectional ones.

The result of these improvements has been the production by the electric phonograph of music possessing the same acoustical properties as that received over the radio. Human speech, too, is now reproduced with almost perfect fidelity. No longer are the "s" sounds missing, or the low notes distorted, as formerly.

Recording Sound on Film. For a discussion of a new discovery in sound-recording, see MOVING PICTURES (Pictures That Talk).

PHORCYS, *fawr' sis,* father of the Gorgons (which see).

PHORONIDA, *fo ron' ih dah.* See ZOÖLOGY (Divisions of the Animal World).

PHOSGENE, *fos' jeen,* a colorless suffocating gas that is fatal to anyone who breathes it in large quantities. It will readily decompose by water into hydrochloric and carbonic acid. It will discolor in acetic acid and benzine, and boils at about 47° F. This gas was one of the principal lung irritants used by the belligerents in the World War (see POISON GAS). It is a deadly gas, but comparatively volatile, and may be carried away in a few minutes by a light breeze, or be dispersed by hot sunshine. A concentration of 1:100,000 is sufficient to incapacitate a man in a few seconds, owing to coughing. Its effect is not temporary, as were those of some of the gases used in war, but often leads to acute pulmonary oedema. In industry it is employed in the manufacture of dyestuffs, and in the chemical laboratory it is a valuable reagent. Phosgene is prepared by exposing equal volumes of carbonic oxide and chlorine to the action of sunlight. It was first made in 1811.

Chemical Formula. The formula for phosgene is $COCl_2$; that is, a molecule consists of one atom of carbon, one atom of oxygen, and two atoms of chlorine.

PHOSPHATES, *fos' fates,* compounds containing phosphoric acid (which see). They are abundant in nature, occurring in phosphate rocks in combination with lime and magnesia; and in the remains of animals (bone ash) and of plants (vegetable mold). Phosphates are necessary to the growth of plants and animals. When crops are produced year after year on the same soil, the natural supply of phosphates is gradually removed, and artificial fertilizing by means of manure becomes necessary. Phosphate rock is the chief source of fertilizer containing phosphates. By crushing the rock and treating it with sulphuric acid, a soluble fertilizer known as superphosphate is made, which acts much more quickly than the pulverized rock. The ground mineral phosphate, though still inferior to the superphosphate, has recently been greatly improved by finer grinding. During the World War, it was used for smoke screens and incendiary bombs. In industry, large amounts are consumed by the baking-powder manufacturers.

Great quantities of fertilizing phosphates are found in beds of leached guano on certain islands of the Pacific, in the West Indies, and in Venezuela. Phosphate rock is found in many places in the United States; the most extensive mines are in Florida and Tennessee, and in 1927 the production amounted to more than 3,000,000 long tons. The United States has set aside reserves of phosphate land to conserve the supply; about 2,307,000 acres of public land have been withdrawn from settlement for that purpose. Research is being carried on to produce phosphoric acid directly from phosphate rock, and to turn out fertilizers comparable to those made in Germany. See GUANO; FERTILIZER. T.B.J.

PHOSPHOR BRONZE. See BRONZE.

PHOSPHORESCENCE, *fos for es' ens,* the emission of a pale, sometimes ill-defined, light, by bodies possessing the quality of becoming self-luminous after exposure to light. It does not have its origin in combustion. The substance in which this peculiarity was first noticed was barium sulphide, the discovery of a Bologna shoemaker in 1602. It was quickly found that there were many other bodies to be added to the list. The ancients knew that a diamond when slightly heated became phosphorescent, and Pliny mentions other gems which cast off a light of their own when in darkness. The color of the phosphorescent light is influenced by the kind of light to which the substance has been exposed, and varies with the nature of the substance. After being exposed to sunlight, calcite gives an orange light, while argonite gives a green light under the same circumstances.

Phosphorescence must not be confused with the luminosity of phosphorus. The light coming from phosphorus is caused by oxidation, and does not depend on previous exposure to light, while phosphorescence is the direct result of such exposure. The application of heat will cause some substances to become luminous in a darkened room; in some cases, notably with a variety of fluorspar, the heat of the hand is sufficient, but every case demands previous exposure to light.

Experiments have proved that there are a great number of substances which become self-luminous after exposure to light, in some cases the phosphorescence lasting only the fraction of a second, in others lasting for days. Mechanical appliances have been used to detect phosphorescence of such short duration as to be invisible to the human eye. Phosphorescence of extremely short duration is usually called *fluorescence* (which see). It has also been shown that the vividness and duration of phosphorescence of many substances, especially cal-

cium sulphide, depend on the presence in that substance of impurities, such as manganese, bismuth, and copper. Gelatin, celluloid, paraffin, and ivory are phosphorescent at very low temperatures, while certain other substances are phosphorescent only when subjected to friction.

The most interesting cases of phosphorescence occur in the animal world, the luminous property belonging to nearly every main group of the zoölogical series. Phosphorus being highly poisonous to all animal tissues, it is apparent that it can play no part in animal luminosity. In some of the lowest forms of life, the whole body is phosphorescent, as in the case of the jellyfish. In other organisms, such as the firefly and glowworm, the luminosity is localized and produced by a highly efficient but minute mechanism. Whether phosphorescence is attractive or protective is a matter of conjecture, though it is commonly supposed that in the case of the firefly the luminosity is designed to attract. Probably, in some insect life, phosphorescence indicates the presence of disease. The great displays of phosphorescence in sea water are due to the presence of innumerable phosphorescent organisms, and are not derived from the water itself. A.L.F.

Derivation. The word *phosphorescence* comes from the Greek *phos*, meaning *light*, and *phoros*, meaning *bearing*.

PHOSPHORIC, *fos for' ik*, ACID. There are three acids of phosphorus (which see), but when the term phosphoric acid is used without a qualifying name, *orthophosphoric acid* is referred to. It is usually produced commercially by treating bone ash or other phosphate with dilute sulphuric acid and subjecting the solution to filtering and concentration. Its salts find use in medicine. T.B.J.

Chemical Formula. The formula for orthophosphoric acid is H_3PO_4; that is, a molecule is made up of three atoms of hydrogen and the radical PO_4 This is an association of one atom of phosphorus and four atoms of oxygen, which act as a single atom in chemical reactions.

PHOSPHORUS, *fos' for us.* The ancient Greeks were acquainted with a yellow, waxy substance that glowed in the dark, which they named *light-bearer*. The Greek words for this name when united form the word *phosphorus*. Common phosphorus is a yellowish, waxlike, non-metallic element that has the odor of a burning match. When exposed to the air in a dark room, it glows, or is *phosphorescent*. It burns at ordinary temperatures, and melts at about 44° C. Yellow phosphorus is very poisonous, and it is unsafe to handle it unless it is under water. Burns from it are difficult to heal, and a small dose of it will cause death. Because of its liability to take fire, it has to be kept under water.

Until recently, the chief use of phosphorus was in the manufacture of matches (which see), but the dread disease known as *phossy jaw*, which is a rotting of the jaw bones, has led to the prohibition of its use in most countries where matches are produced. All workmen engaged in the manufacture of phosphorus suffer from bone diseases.

When burned in a good supply of air, phosphorus forms the dense, white vapor called phosphoric oxide, which immediately absorbs water from the air and dissolves, forming phosphoric acid. When compounds of phosphorus are heated to a high temperature in closed vessels, the phosphorus distills, and the vapor, when collected over water, is changed to a yellow liquid that settles to the bottom. The most extensive phosphorus works are at Oldbury, England; Lyons, France; and Niagara Falls. Bone ashes and phosphate rock are the substances generally used in its manufacture.

Phosphorus is necessary to the growth of plants and animals. The plants take phosphorus from the soil (see FERTILIZER), and animals obtain it from the plants. It is found in the bones and in the brain and nerves in larger proportions than in any other animal tissues.

Red phosphorus, an allotropic form (see ALLOTROPY), is made by heating ordinary phosphorus to a high temperature in a closed vessel. It is a brownish-red powder and does not burn, nor does it melt except at high temperatures. Phosphorus is not found free in nature, but exists in plants and animals and in phosphate rocks. Its chemical symbol is *P*. See PHOSPHATES. T.B.J.

PHOSPHORUS, in astronomy. See EVENING STAR.

PHOSSY JAW. See PHOSPHORUS.

PHOTIUS, *fo' shihus* (about 820–about 891), an eminent Byzantine prelate and statesman, a man of great intellect and literary power, celebrated because of his interest in the separation of the Eastern and Western churches. He was born in Constantinople, and was elevated from the standing of a layman to the patriarchal dignity of secretary of state to Michael III. Pope Nicholas I deposed him in 863, but Photius in turn deposed and condemned Nicholas in 867, thereby laying the foundation of the schism between the Greek and Roman churches. In the same year, Photius was exiled, but later was restored to patriarchal dignity.

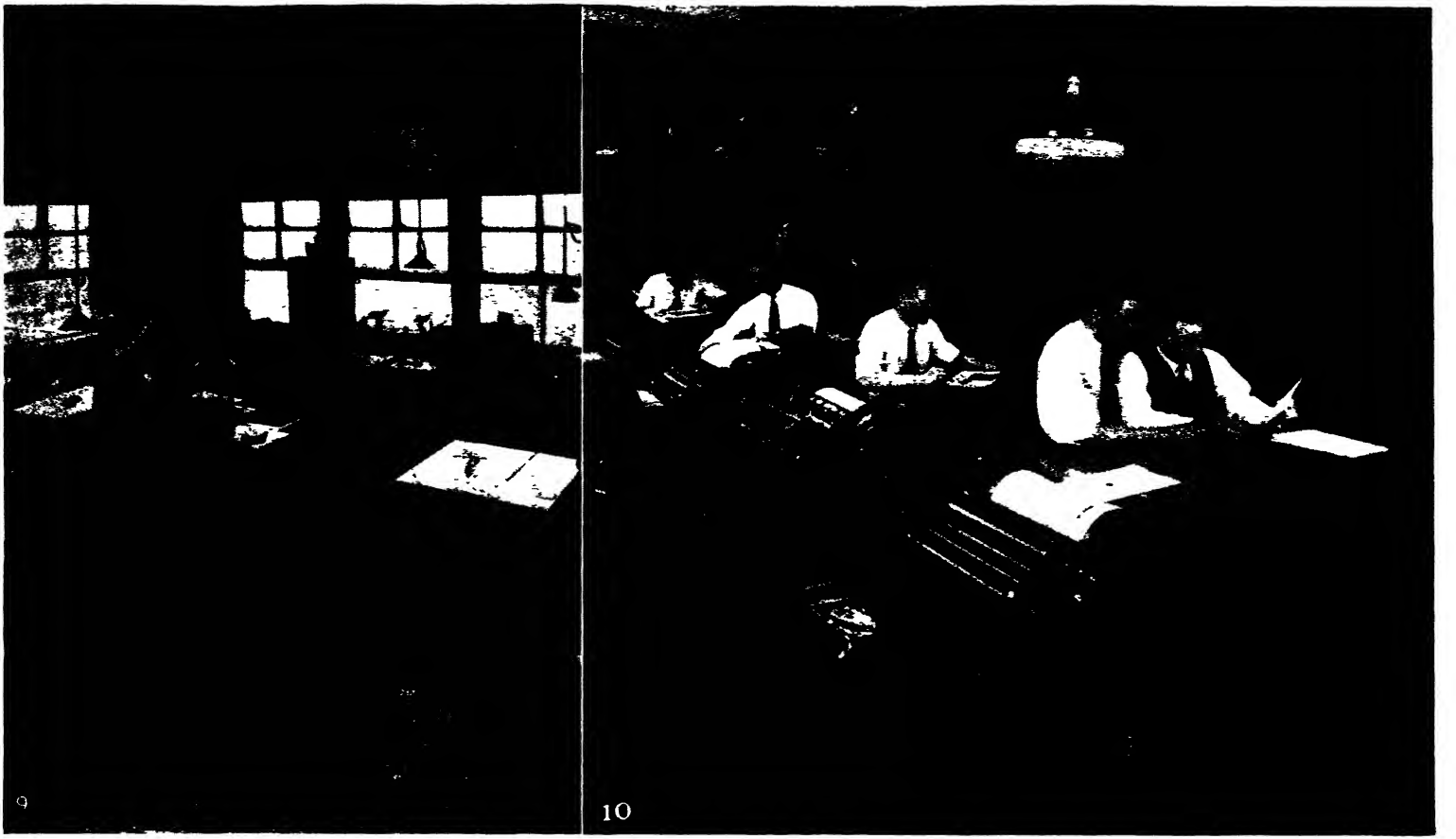
In 879 he assembled a council to discuss the differences at issue between the East and Rome, and the decisions were made according to the dictates of Photius. As a result, he was excommunicated by the Pope in 881, and five years later was exiled by Leo the Philosopher; he died in an Armenian monastery. Biographers disagree as to the character of Photius; those of the Roman Catholic Church accuse him of craft, perfidy, and violence, while the Greek Church reveres him.



The Process of Photo-engraving. (1) Photographing the copy. (2) Developing and "stripping" the negative. (3) The negative is used to print image on flat sheet of metal. (4) Shows the metal plate being printed by artificial light. See article, page 5579.



The Process of Photo-engraving. (5) Clamping the printed metal plate into the etching machine (6) Lowering the plate into the acid, which etches away the unprotected surfaces, leaving the image in relief. (7) Etching requires more than one "bite." Between bites, the halftone plate is painted in part, to prevent further etching. (8) The finisher at work. An actual WORLD BOOK plate is being freed from blemishes. See article page 5579.



The Process of Photo-engraving. (9) The blocking room, where metal plates are mounted on wood blocks, to make them type-high. (10) Proofing room, where prints are carefully made, to prove the perfection of the plates. See article, page 5579.

PHOTO-ENGRAVING is the process of preparing engraved plates, or blocks, for printing by means of photography and etching. The plates are prepared on two general plans, one in which the background is etched away, leaving the design or picture to be printed in relief, and the other in which the design is etched into the plate, leaving the background in relief. The first is known as *relief* photo-engraving, and the second as *intaglio* photo-engraving, or photogravure. Both depend upon the principle that certain substances, such as gelatin, some forms of albumen, and bitumen, harden under the action of light, so that they are not soluble.

General Principles. A plate for printing is produced by photographing an acid-resisting print on a metal plate. This protects certain areas of the plate and leaves others open to the action of the etching acid. The acid is applied, and when the etching is sufficient to ensure proper printing depth, the plate is finished by a kind of retouching process, and is then ready to be inked and printed.

There are numerous steps in the process above outlined, and there are several different ways of accomplishing it, but all the methods have as their basis the fact that light will create an insoluble photographic image on a plate treated with substances such as those named above.

The halftone (which see) is the most common form of relief photo-engraving, and may be made one of the most effective.

Gelatin Relief. In making a plate in relief for the reproduction of linework, a glass plate coated with a film of gelatin and potassium bichromate is exposed under a black and white negative. The film is then soaked in water, and the lines that were protected by the dark parts of the negative swell, while the other parts of the film do not swell. The film is then laid in a mold, and a wax or plaster impression of it is taken. From this impression an electrotype (see ELECTROTYPING) is made. With the mounting of the electrotype on the block or plate for the printing press, the process is completed.

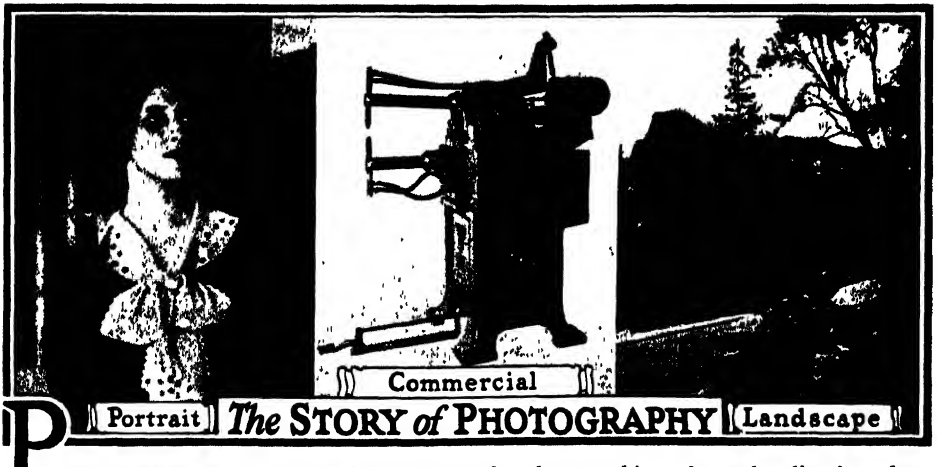
Photogravure. In the photogravure process, a copper plate, covered with a sensitized film, is exposed to a black and white positive, or photograph, on glass. The parts under the clear spaces are hardened, and those under the shaded parts, corresponding to the shades in the picture, remain soluble in varying degrees. The plate is then washed, and the soluble portions of the film are removed, leaving the metal bare. The plate is then etched and hardened. The grain often seen in photogravure pictures is produced by sprinkling the plate with powdered resin, which is heated in.

The photogravure process is employed in the reproduction of etchings, fine engravings, and other works of art where an exact reproduction is desired. It is also in general use in preparing illustrations for books, when a less expensive process of preparing the plate is used, and plates are often prepared for rapid work on rotary presses.

See illustrations, pages 5576, 5577, 5578.

Related Subjects. The reading of the following articles in these volumes in connection with this topic is recommended

Engraving Etching Halftone Intaglio



PHOTOGRAPHY, *The* STORY *of* PHOTOGRAPHY

PHOTOGRAPHY, *fo tog' rah fie,* has been brought to such a degree of perfection that there is scarcely an object in nature that is beyond the reach of the camera. While the more common purposes for which photography is employed are the making of portraits and the photographing of merchandise for advertising, it is of great value in the scientific world. It has also become an indispensable agency in education; and its use in photographing dramatic action for entertainment is the widest use of all. The camera and the telescope have



Photo Visual Education Service

PHOTOGRAPH OF A NEGATIVE THE POSITIVE

made possible complete charts of the heavens, in which every star visible is located, and they have enabled us to make pictures of the moon and planets that give an idea of their structure By use of the electric light, objects can be photographed under water, and pictures are now common that show the natural surroundings and movements of fish and other aquatic animals. By attaching the microscope to the camera, the scientist can record pictorially the wonders of insect life. Formerly, the naturalist hunted wild animals with the rifle and studied the mounted specimens, but now he hunts them with the camera and photographs them among their native surroundings so as to show their ways of life, their habitats, and their native grace and beauty.

Processes. The process of photography includes three steps, known respectively as *exposure, development,* and *printing.*

Exposure. The sensitized plate consists of a piece of glass or celluloid film, one surface of which is covered with a film of gelatin containing a composition of silver and bromine; that is, silver bromide, which is exceedingly sensitive to the action of light. The exposure is made by means of the camera (which see). In making the exposure, the photographer first secures upon the ground-glass screen of the camera a distinct image of the object. The length of the exposure is determined by the sensitiveness of the plate and the strength of the light; the best cameras have attachments that can be adjusted quickly to meet any ordinary conditions. The photographer makes the exposure by opening and closing the shutter, by pressing a rubber bulb or a spring connected by a flexible cable

Developing. The plate or film does not show the effect of the exposure when taken from the camera, and developing is necessary to bring out the picture. This is usually done in the *dark room,* which is illuminated by a lamp whose flame is enclosed in a red- or an orange-colored glass globe, since these rays will not affect the sensitized film. The plate is placed in a shallow tray containing a developing fluid, and the tray is gently rocked so that the fluid may act upon all parts of the film. The developer dissolves the bromide that has not been acted upon by the light and leaves the silver, which forms the dark parts of the picture. When the details of the picture are brought out, the plate is taken from the solution, washed, and placed in a solution of hyposulphite of soda and alum, known as the *fixing bath.* This solution dissolves all the silver bromide that has not been acted upon, and leaves the picture clear and sharp. The developing process is now completed, and the picture


HOW LIGHT PAINTS A PICTURE
MAKING THE EXPOSURE
DETAILS OF THE EXPOSURE
FRONT AND BACK LENS
SHUTTER BETWEEN LENSES
LIGHT RAY FROM LENS TO FILM
IMAGE ON FILM
CAMERA STAND
BULB TO CONTROL LENS
PLATE BEFORE DEVELOPING
PLATE PARTIALLY DEVELOPED
PLATE FULLY DEVELOPED (NEGATIVE)
PRINT ON PAPER FROM NEGATIVE

called the *negative*, is thoroughly washed in running water, then placed in a rack to dry. The developed plate is called the negative because in it the lights and shadows of the object photographed are reversed.

Printing. The final step in the process consists in printing the *positive*, which is the photograph as we know it. Photograph paper is prepared by coating one surface of a light paper with albumen, to which has been added a small quantity of ammonium or sodium chloride, then soaking the paper in a solution of nitrate of silver. Many grades and styles of this paper, already prepared, are on the market. The film surface of the negative is laid upon the sensitive surface of the paper, and the two are fastened together in a printing frame and exposed to the light. The time required for printing depends upon the nature of the negative, the sensitiveness of the paper, and the strength of the light. Most of the printing papers used to-day require developing the same as plates, as the image does not appear until it is developed. When the print is taken from the frame, it is washed and placed in a fixing bath. After fixing, it is washed and dried.

The diversity of effects produced in photography is due largely to the varieties of printing papers. A rough paper produces a soft picture without sharp lines. If bromide is used instead of silver, in preparing the paper, a brown picture is obtained, and combinations of these substances in different proportions give different tints. The blue print (which see) is made on a paper sensitized with a solution of potassium ferrocyanide.

Progress in Photography. Photography is a recent art. The first practical application of it was made by Daguerre in 1839 (see DAGUERREOTYPE). The first sunlight picture of the human face was made by John W. Draper of the New York University, in 1840, and the photograph as we know it has been developed since 1850. But, notwithstanding the fact that the art is barely a hundred years old, photography has reached such a stage of perfection that almost incredible results are achieved by it. Films so sensitive that a mere flash of light upon them will produce a complete picture are in such general use that they cause no comment, and their perfection made the moving picture possible. The use of these pictures in scientific research is told in MOVING PICTURES.

Prior to the World War, the optical glass necessary for camera lenses, and the photographic chemicals, were made in Germany almost exclusively. But before the end of the war, American chemists and physicists had solved these problems, and the manufacture of these products was being carried on successfully and independent of foreign manufacturers. Development did not stop with the end of wartime demands, but has continued.

Aerial Photography. In the World War, the camera and the airplane enabled the officers of the contending armies to learn many facts concerning the location and strength of the enemy's lines. Long-range machine guns made it necessary for airplanes to fly at great heights, but the use of panchromatic plates, that is, plates sensitive to the whole visible spectrum, and ray filters made it possible for the aviator-photographer to take clear pictures at an altitude as great as three miles. A ray filter is a substance, usually a sheet of dyed gelatin, which allows certain rays to pass but is impervious to others.

Photography from the air is now employed for planning civic improvements, making surveys, selling real estate, and many other purposes requiring pictures that cover large areas. Hundreds of films taken from an airplane and fitted together have made photographic maps of cities. Every street and building in a city is shown, yet only a few hours are required for taking the pictures. The Canadian Reclamation Service has made use of this procedure to survey a territory which it is proposed to reclaim by drainage. A series of pictures, taken from the air and joined into one mammoth photograph, showed 1,500 square miles of timber holdings. Because much of the area was flooded, it would have been difficult, if not impossible, to have surveyed it in the ordinary way.

This method is known as *vertical*, or *mosaic*, photography, it involves a high degree of skill and a vast amount of labor in the process of completing one great photograph from scores of smaller ones. The illustration on page 5583 shows how the photographs are taken. All must be on the same scale; therefore the airplane's flight must be maintained at a uniform height. The pictures are made so that the edges of them overlap. How this is accomplished, the artist shows in a drawing upon a completed section of the great picture.

Amateur Photography. Since the invention of the camera, the pleasure of "taking pictures" has been within the reach of every one, and all appliances and material have been perfected to such a degree that any boy or girl can use the camera, develop the films, and print the photograph with success. A few hints to the beginner may be of assistance:

1. Get a camera with a good lens. If possible, focus a picture on the ground-glass screen and study the clearness of the details before purchasing.

2. Study the book of directions carefully, and follow the directions to the letter.

3. Before making an exposure, study carefully the object to be photographed. Note the light and shade effects. If you are photographing a landscape, see that no undesirable objects appear in the foreground in the field of the camera. Place the camera so that the skyline will be above or below the middle of the picture.

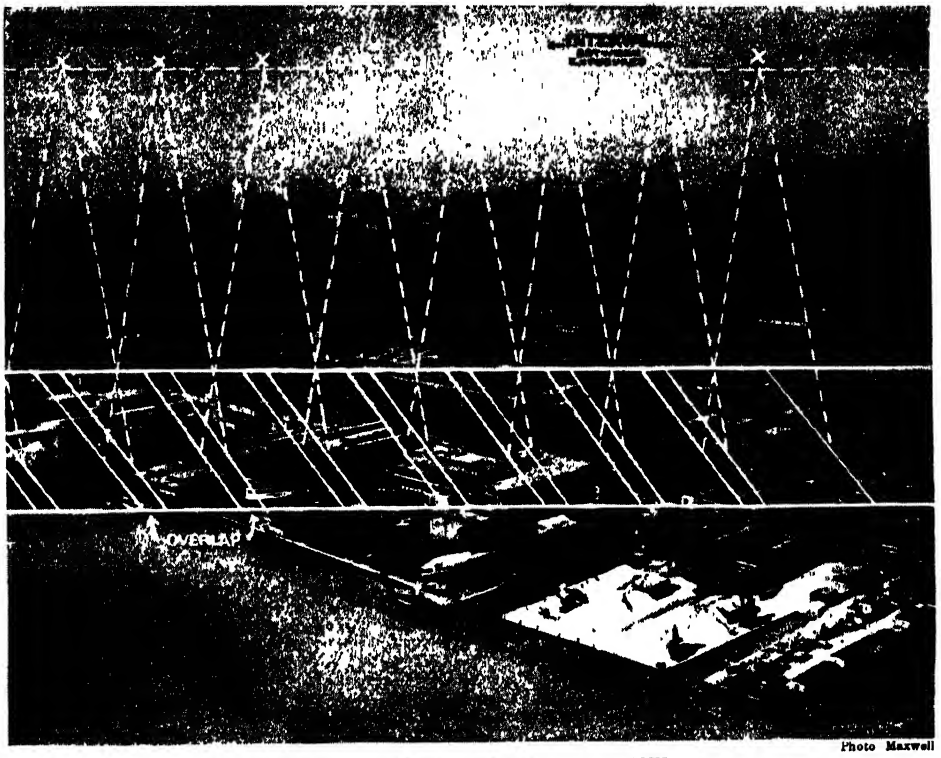


Photo Maxwell

ONE METHOD OF MAKING AERIAL PHOTOGRAPHS

A succession of exposures is made with the camera pointing directly downward and with the airplane in a perfectly straight line of flight The resulting pictures will be on a uniform scale They are afterward cut apart and joined so that each individual picture overlaps the one at the right and the left. Then a photograph of this mosaic is made, care being taken to remove all defects resulting from cutting and pasting

4 If you do your own developing, better results will be secured by using the developing tank than by the ordinary apparatus in the "dark room."

5. Be sure that your negatives and prints are *thoroughly washed*. This means that you must wash them three or four times.

Amateur Motion-Picture Photography. Motion pictures can be made successfully by amateurs by means of special cameras which have recently been placed on the market. The film is about half the width of standard film, and is shorter than the rolls used in professional work. The "cranking" is done by motor power to give smooth and continuous operation. The camera can be loaded in daylight, like an ordinary one. There is a projection machine available by means of which these pictures can be shown in the home or lecture room. See MOVING PICTURES.

Photography by Telephone and Radio. A few years ago, the idea of transmitting photographs by wire seemed improbable, yet to-day it has become a commonplace. Pictures taken on one coast of America are reproduced within the space of a few hours, in the newspapers of the opposite coast. Such astonishing clarity characterizes this type of picture that usually little difference can be detected in its appearance from that of a halftone made from an original photograph.

Telephoned pictures have been made possible through experiments by engineers of the American Telegraph and Telephone Company, working with the Western Electric Company. The process depends upon the invention of a so-called photo-electric cell and a light valve which works as an electric camera shutter. Operating on the same principle as the telephone diaphragm, the photo-electric cell sets up vibrations in the transmitter. A positive film, printed from the original negative, is placed in a cylinder, and the electrical impulses, set up by light waves passing through the film, are transmitted by an apparatus similar to that used in radio broadcasting. The light valve picks up those fluctuating electrical impulses at the receiving end, and translates them into corresponding light pulsations.

The radiophotogram, though not yet so perfect as telephone photography (such pictures are called *telephotos*), makes possible wireless transmission of pictures to even



Photo Wide World

THIS PICTURE WAS TELEPHONED

In 1924 the art of sending photographs by telephone was first put to commercial use One of the first pictures to be sent over the wire was that of the High Level Bridge over the Cuyahoga River at Cleveland, O , it was sent to the offices of the American Telephone and Telegraph Company in New York City The above illustration shows a reduction of about thirty per cent from the size of the original photograph In the original the clearly indicated vertical lines, which are characteristic of telephoned pictures, appear in stronger detail, with a resulting coarser effect.

greater distances than by telephone. The invention is chiefly the work of Captain R. H. Ranger, engineer for the American Radio Corporation. The picture-producing mechanism operates on the principle of the dot-and-dash message, and is propelled by electrical impulses released from the antenna of a high-power station. A person watching the formation of a picture would see a sheet of white paper slowly change from pure white to a dotted area resembling a stippled etching. Outsiders cannot tune in on the radiophotograms because the rate of sending them can be regulated to an accuracy of one point in 100,000, and a code may be used. Anyone receiving the impulses gets only a blur, unless he knows the exact rate at which they have been transmitted.

Color Photography. Photography in colors was suggested in 1859 by Ducos du Hauron, a Frenchman. With other experimenters, he shared the idea that if the eye can see only three colors and forms other colors of the spectrum by admixture, the camera lens must likewise take in these three colors. If these could be photographed one at a time, on three separate plates, and the images superimposed upon each other in printing, he believed he could get a reproduction of the colors of nature.

This is now accomplished by the use of sensitized plates and color filters. At first, triple exposures were made on three plates, but triple-lens cameras have made single-exposure color pictures possible. The original one-exposure camera was the invention of Ducos du Hauron. Only one lens is used for another type of color photograph, which makes three successive exposures through three color filters on a single plate. When three plates are used, each is developed on a temporary celluloid or carbon-tissue support. Positives are then printed by superimposing the constituent prints.

Experiments in color photography have been extended to the motion-picture field, with very promising results. In 1929 the first all-color talking and singing moving picture was produced in the United States, and it elicited general commendation.

Related Subjects. The reader is referred to the following articles in these volumes:

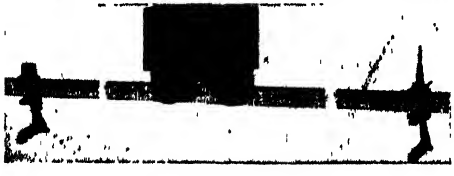
Camera	Lens
Daguerreotype	Moving Pictures
Halftone	Photo-Engraving

PHOTOGRAPHY, SOLAR. See SUN.

PHOTOGRAVURE, *fo toh grah vure'*. See PHOTO-ENGRAVING.

PHOTOMETRY, *fo tom' e trie*, the science of measuring intensities of light by comparison with a standard unit. The brightness of the illumination depends on the source and its distance from the body illuminated. Various units are employed. The *British standard candle*, made of spermaceti, and of such a size that six candles will weigh one pound, was formerly in general use, but has been replaced by the *Harcourt pentane lamp* for scientific calculations. The British candle burns at the rate of 120 grains (of its own material) per hour. The Harcourt lamp, in which air is drawn over pentane (hydrocarbon of the paraffin series) and the mixture burned in a standard burner, has an illuminating power equal to that of ten standard candles. A more convenient standard is an electric incandescent lamp run at a specified voltage.

Photometers are instruments devised to make comparisons of illuminating power. In simplest form, a photometer consists of a white paper screen with a grease spot in the middle, arranged on a sliding scale between two lights.



A SIMPLE PHOTOMETER

It consists of a graduated rod one meter (39+inches) in length, mounted on two supports One of the supports bears a gas jet, and on the other is a candle holder. A box painted black (so it will not cast reflections) slides along the meter rod, and contains a Bunsen screen with two mirrors at right angles, for viewing both sides of the screen at the same time.

When the screen has been moved until the lights on both sides are equally intense, both sides of the screen will look alike. The law applicable here is that the strengths of two lights are proportional to the squares of their respective distances from an illuminated body. An ordinary photometer appears in the illustration. Where great accuracy for scientific work is required, a device called the Lummer-Brodhun photometer is used. Very sensitive instruments which include a telescope and a polarizing apparatus are necessary to compare the light of the stars and other heavenly bodies. See LIGHT; CANDLE AND CANDLE POWER. A.L.F.

PHOTOSPHERE, *fo' toh sfeer*. See SUN (The Sun's Surface).

PHOTOSYNTHESIS, *fo toh sin' the sis*. See BOTANY (Contributions to Human Welfare); BIOCHEMISTRY.

PHRENIC, *fren' ik*, **NERVE.** See DIAPHRAGM.

PHRENOLOGY, *fre nol' o jie*, a so-called science quite modern in development, which grew out of a false interpretation of facts related to the progress of anatomy and physiology in the early nineteenth century. Its founder, Franz J. Gall (which see), represents the combination of a man who was versed in science, who was a notable contributor to the anatomy of the brain, and who also was an adherent of the impressionistic methods (such as Lavater used and may have suggested to him); this led him to assert as proved facts arbitrary associations of mental qualities with bodily characteristics. The system was popularized by Spurzheim, who came to America and there spread the doctrine with marked success. Spurzheim died in Boston, and was given a public funeral attended by the president of Harvard College and other dignitaries.

While there are suggestions in classic and medieval lore of the association of parts of the head with mental functions (the front to judgment, the middle to imagination, the back to memory), phrenology took its start with the observations of Gall that men with certain prominences of the skull possessed definite qualities in marked degree. He observed the heads of students and related their proficiencies with their "bumps"; and thus located the "organ" of *number* in mathematicians, of *tune* in musicians; he observed the devout at church and located the "organ" of *reverence*; he observed poets and located the "organ" of *ideality*; he observed criminals and located the "organs" of *theft* and *murder*; he observed the insane and related their deficiencies to the poor development of intellectual parts of the skull.

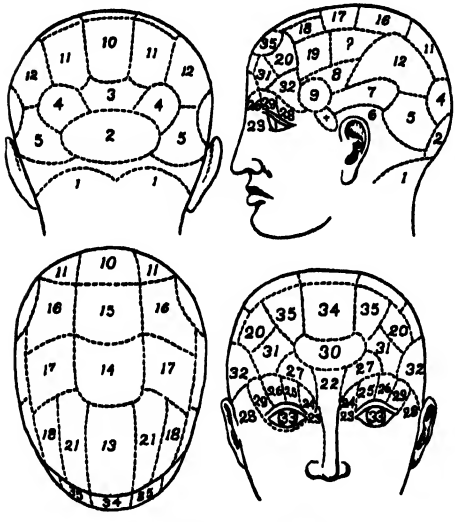
When we read that "love of approbation" was large in a lunatic who thought herself the Queen of France; "acquisitiveness" was large in a pickpocket; "destructiveness" was large in a student fond of torturing animals (who became a surgeon), and in an apothecary who became an executioner; that "love of offspring" is located in the back of the head because that part is best developed in women and apes; that "concentrativeness" was large in cats, and in a clergyman fond of his home, we cannot but be amazed that such ridiculous conclusions could be seriously advanced in the nineteenth century and find so many followers that hundreds of societies and a score of journals were founded to continue and practice this study. Prepossession and delusion could do no worse in the darkest ages of superstition.

It must be admitted that these illustrations are rather extreme, yet not as extravagant as the claims of practitioners who followed Spurzheim, and for a few dollars read character and predicted careers, and still do so. If we must consider these errors seriously, we may note that the division of the brain into such areas is absolutely arbitrary; that the assumption

that shape of brain can be read minutely on the skull is false; that the so-called faculties are equally arbitrary and irrational. The whole system is a tissue of baseless assumptions founded upon a crude physiology and a cruder psychology.

The sciences of physiology and psychology have established that there is division of functions among the portions of the brain, but that this is in the general nature of sensory and motor areas, with "centers" for the prominent functions of correlation of impressions with impulses, such as writing and acts of skill, all of which involve intelligent conduct. To refer individual differences in these aptitudes to variable development of brain tissue would involve a comprehensiveness of knowledge which we cannot remotely approximate. The actual knowledge of the nature of brain function adds, if that be possible, to the utter irrelevance of phrenology, which thus remains the extreme as well as the latest example of pseudo-science. The readiness with which it found support was due to the persistence of the interest in "occult" forms of thinking, and in ambitious attempts to guess the secrets of nature, as well as to the practical purpose of reading character and predicting careers. In this respect, it conforms to the general history of the pseudo-sciences.

The subject should not be dismissed without emphasizing the supreme importance of the logic of science in establishing reliable conclusions, and the slow and difficult growth of knowledge upon which its progress depends. The pursuit of science requires a specialized training, a command of method, and an objective interest. It is the subjective interest and the eagerness to apply hasty and unsupported conclusions that are responsible for the persistence of pseudo-scientific notions. It is not so much ignorance as the credulous habit of mind that is to be feared; to teach this lesson and train the mind in scientific thinking is an essential part of education. J.J.



PHRENOLOGICAL CHARTS

Believers in this pseudo-science profess to find certain personal qualities related to the form of the head While not endorsing such views, the following table is given as a key to the diagrams of the head, that the beliefs of phrenologists may be better understood.

AFFECTIVE

I—PROPENSITIES	II—SENTIMENTS
(1) Amativeness	(10) Self-esteem
(2) Philoprogenitiveness	(11) Love of Approbation
(3) Inhabitativeness or Concentrativeness	(12) Cautiousness
(4) Adhesiveness	(13) Benevolence
(5) Combativeness	(14) Veneration
(6) Destructiveness and Alimentiveness	(15) Firmness
(7) Secretiveness	(16) Conscientiousness
(8) Acquisitiveness	(17) Hope
(9) Constructiveness	(18) Wonder
	(19) Ideality
	(20) Wit
	(21) Imitation

INTELLECTUAL

I.—PERCEPTIVE	
(22) Individuality	(30) Eventuality
(23) Form	(31) Time
(24) Size	(32) Tune
(25) Weight	(33) Language
(26) Coloring	
(27) Locality	II.—REFLECTIVE
(28) Number	(34) Comparison
(29) Order	(35) Causality

Related Subjects. The following articles in these volumes, while not bearing on phrenology, are of interest in this connection, because most of them deal with pseudo-sciences

Alchemy	Necromancy
Astrology	Occult
Clairvoyance	Palmistry
Conjuring	Physiognomy
Demonology	Psychical Research
Divination	Psychoanalysis
Faith Cure	Spiritualism
Hypnotism	Suggestion
Magic	Superstition
Medium	Telepathy
Mesmerism	Trance
Mind Reading	Witchcraft

PHRYGIA, *frij' ih ah,* in ancient times a country in the west-central part of Asia Minor (which see). Eventually, it became a part of the Roman Empire, and for governing purposes was divided, the northeastern portion becoming a part of the province of Galatia, and the western a part of the province of Asia. On the Phrygian plains, since ancient times, large flocks of sheep have been pastured, whose fleece is of the finest quality. Gold and marble were once important products, and the culture of the vine was the occupation of large numbers of people. In *Acts* XVI, 6, Paul and a companion are recorded as preaching throughout Phrygia and the region of Galatia. The Phrygians probably entered Asia Minor from Thrace, and were of an Indo-European race related to either the Greek or the Teuton race. They were a peaceful people whose main occu-

pation was cattle-raising and agriculture. In legend, Phrygia was the home of a race of powerful kings, including Gordius and Midas, whose great rock-hewn tombs are still pointed out in the mountains (see GORDIAN KNOT; MIDAS).



LOCATION MAP

Ancient Phrygia is shown in solid black. The surrounding provinces are identified below:

(*a*) Cappadocia (*f*) Greece
(*b*) Paphlagonia (*g*) Mysia
(*c*) Bithynia (*h*) Lydia
(*d*) Thrace (*i*) Caria
(*e*) Macedonia (*j*) Pisidia

PHRYXUS, *frik' sus.* See DARDANELLES (In Myth and Story).

PHTHISIS, *thi' sis.* See TUBERCULOSIS.

PHYLLODIA, *fil' o dih ah.* See ACACIA.

PHYLLOXERA, *fil ok' se rah,* a species of plant louse that attacks grapevines. This insect has fed on wild vines of North America for centuries, but its destructive powers were not fully realized until about the middle of the nineteenth century, when it was carried to Southern France upon native American vines. There its ravages caused the destruction of one-third of the vineyards; vine-growers in other sections of Europe to which it spread also suffered enormous losses. The phylloxera attacks either the leaves or the roots of the vine, but it is the latter form of attack that causes the most serious injury. As nearly all American vines are more or less free from root attacks, and European vines suffer from them more than from leaf attacks, the ravages of the insect are best prevented by grafting European varieties on American stocks. Smothering out the insects by inundating the vineyard with water and saturating the soil about the roots with carbon bisulphide are standard measures of combating the phylloxera. When the roots are attacked, they become enlarged, then die and rot away. The leaves then turn yellowish, the vine ceases to grow, and in time the whole plant is destroyed. See GRAPE (Methods of Culture). W.J.S.

Classification. The phylloxera is one of the insects called *aphides* (which see). Its scientific name is *Phylloxera vastatrix.*

PHYLUM, *fi' lum.* See ZOÖLOGY (Divisions of the Animal World); CLASSIFICATION; INVERTEBRATES.

PHYSICAL CULTURE. See PHYSICAL EDUCATION.

PHYSICAL EDUCATION, with its present outlook and aspirations, as an integral phase and subject in general education, may be defined as the contribution made to the complete education of the child by the fundamental psychomotor activities, or the big brain-muscle movements. These activities include fundamental life movements, play, athletic and dramatic games, dancing, swimming, gymnastics, camping, hiking, scouting; and social service and prevocational activities, such as gardening, farming, and housekeeping, which are vigorous, healthful, and genuinely educative.

The term *natural,* or *naturalized,* as applied to physical education, may be explained as the education of the child by means of the big brain-muscle activities which are based on the primitive, natural movements of human beings; which have mental, moral, and social values; which are biologically sound and healthful; and which aim to prepare the individual very directly for efficient living in present-day civilization.

Physical education which is best adapted to children and youth in America to-day should serve several useful purposes. Some of these are present in the minds and desires of growing boys and girls, and others should be present in the minds of teachers, parents, and other adults, who should acceptably and efficiently supervise and guide, without unnecessary interference, the wholesome activities of children and youth.

From the Viewpoint of Youth. The natural and reasonable aims and objectives of physical education, as they occur in the minds of boys and girls, include the following:

1. To satisfy the natural instincts and wholesome impulses and desires for play, games, walking, running, climbing, and swimming, and for all forms of healthful, robust, vigorous action (outdoors, whenever possible)

2 To solve the problems and to work out the projects—intellectual, social, moral, and physical—which pupils wish naturally and logically to work out through the activities which belong to physical education

3. To express the ideas, feelings, and moods appropriate to children and youth which belong to the field of dramatic action, and which may be expressed in large movements by dancing, pantomime, drama, pageant, and festival.

4 To experience the satisfaction of adventure in wholesome, robust, bodily action; to taste the pleasure of strenuous combat in fair contest, to strive for the joy of victory with the chance of defeat; to acquire sportsmanship; to follow as well as to lead; to win membership on "the team"; and to achieve leadership in the games, competitions, and projects of various kinds which are determined by the instincts, by imitation or creative effort, and by the social life and environment of the young.

5. To gain increased quickness, strength, endurance, skill, power, better posture and bearing, and other worthy results of effort and improvement, which boys and girls appreciate as desirable or necessary means for the more satisfactory realization of their own larger aims and ambitions.

The Viewpoint of Adults. Young people to-day cannot find favorable opportunity to express themselves in constructively helpful activities unless the necessary opportunities

are assured to them by responsible adults. The aims and objectives of teachers, parents, and others related to rational physical education should include prominently the following:

1. To understand pupils collectively and individually; to understand their physical, mental, social, and moral capacities, needs, and limitations, with reference to the most effective adaptation of a physical education program to them.

2. To appreciate intelligently and sympathetically the various aims consciously held by the pupils in relation to physical education, and to help the pupils in all possible and reasonable ways to achieve these aims.

3. To secure for the pupils in the schools the most favorable and abundant environments, opportunities, and facilities for physical education in outdoor life; in playgrounds, athletic fields, gymnasiums, swimming pools, and, when better facilities are not available, the best use of the schoolroom.

The opportunities most to be desired for physical education are always out of doors, and the facilities for this form of education should include, whenever possible, opportunities for excursions, camping, nature craft, gardening, farming, trail making, and other types of robust, outdoor, useful activities.

4. To help the pupils in every possible way (unconsciously for the most part, so far as the pupils are concerned) to attain the physiological and hygienic benefits which are essential by-products of a satisfactory program of physical education. Prominent among these benefits are:

(a) Health and vitality necessary for the individual and the race.

(b) Good posture and bearing

(c) Preservation and improvement of all the functions of the body.

(d) Development of agility, quickness, strength, endurance, and all other physical qualities desirable for the pupil at the time, and for the individual in later life.

5. To help girls and boys, while working out their own appropriate aims and ambitions in activities of physical education, to achieve in the fullest possible measure:

(a) Such mental benefits as attention, concentration of effort, will power, coordination of action, persistence, initiative, resourcefulness.

(b) Such social benefits as fellowship, followership, leadership, fair play, group loyalty.

(c) Such moral benefits as courage, honor, sportsmanship, self-sacrifice.

Physical Education Program. The activities of a sound program of physical education for growing boys and girls may be classified under eight unit headings. These are:

1. Natural activities of daily life such as walking, running, jumping, climbing, and the emergency activities, such as self-protection, skill in dodging traffic, first aid, life saving, and other skills and activities which are demanded by the increasingly complex, confusing, and hazardous civilization of to-day. These natural activities include also hiking, swimming, and riding horseback. Camping also belongs here; the activities of camping reproduce, for those living under artificial conditions of the present day, a natural environment, and give opportunity for the practice of wholesome activities which are racially old and also beneficial now.

2. Free play and games include the play skills of catching, running, dodging, chasing, and the games of simpler or lower organization. The free-play activity is a life activity of the child up to school age, and through the first two grades, at least.

3. Athletics and sport. This unit includes minor and major sports, such as baseball, basketball, hockey, football, soccer, rugby, swimming, tennis, volley ball, golf, and the like.

Growing out of units 2 and 3 are a great variety of club activities, such as athletic clubs, and others. These club activities form a very important part of a natural and rational program of physical education. Through school and club excursions, picnics, field trips, as well as play days and community programs, there can naturally grow up and develop a great number of interesting projects for children and youth, and in these their initiative, organizing ability, and social responses are developed.

4. Dramatic expression includes rhythmic and mimetic activities, pantomime, dramatization, dancing, festivals, and pageants.

5. Social service and pre-vocational activities. This unit includes:

(a) All natural, wholesome industrial pursuits of boys and girls; chores and constructive activities.

(b) Activities also which will give the child the physical, social, mental, and moral training for the type of vocation into which he will be likely to go.

It is believed by many educators that the physical education of the individual is not complete unless he is following out the plan which primitive man found best fitted to his needs—that of physical toil interspersed with physical play. The conditions of modern life are such that the opportunity given the child to do the old-fashioned chores is becoming less practicable and possible. Farm life still provides this opportunity to some extent for a selected group of boys and girls, but the needs of city-reared children must be met by making available purposeful, big brain-muscle activities in school and in summer camps; hiking trips; excursions of the scouting type, and the like.

Because of the basic and indispensable benefits accruing to the physical, mental, social, and character life of children and youth, from the wide repertoire of helpful activities performed in the more primitive and wholesome conditions of former generations, perhaps one of the most important problems of education to-day, in school and at home, is to discover and provide practically the best equivalent of the old-fashioned "chores."

Out-of-school activities, manual-training activities, and other forms of useful industrial activities may quite logically be included in a comprehensive program of physical education if these activities are educative and healthful.

6. Self-testing activities include a great variety of exercise in jumping, vaulting, and climbing, apparatus

stunts, running for endurance, bodily control, athletic skill tests, physical-efficiency tests, and others.

7. Individual corrective exercises are inevitably rather formal exercises adapted to the correction of specific individual defects of posture, and other types of physical defects for which carefully adapted remedial exercises will be helpful.

8. Recreational activities. This unit can obviously apply only to adult activities in physical education, for children need no recreation in the sense that adults need the contrasting recuperative change from vocational work.

9 A successful program of physical education for children and adolescent youth will develop favorable attitudes and some useful skills for adult recreation in later life. In any case, physical training during the school age should not develop, as has been the case frequently in the past, through formal, artificial gymnastic programs, a distaste for wholesome activity carried on either indoors or outdoors.

10. Natural gymnastics. Gymnastics are considered here as answering the same purpose and need as practice will answer in any other phase of a progressive educational program. When need is recognized for more practice in connection with any activity mentioned in the previous units of physical education activities, then such practice and drills should conform to the general steps and methods applying in rational practice and drill in any subject.

Participation by girls and boys in the more vigorous activities of a physical-education program should always be preceded by health and medical examination to determine the fitness of the individual for the proposed activities.

The best schools now conduct separate classes in physical education for boys and girls after the beginning of the adolescent period. The tendency, in the recent past, has been to copy too closely, for girls, the athletic and gymnastic programs adopted for boys. Athletics of reasonable type, and group games, properly conducted, are fully as valuable for girls as for boys; but it is important that the activities of girls and young women should be selected with reference to the greatest benefits to be conferred upon them with their own needs.

The best principles in vogue to-day involve advocacy of intramural athletic games for girls and young women, with avoidance of the inter-scholastic contests which are so popular for boys' schools and men's colleges.

Wide inquiry among those who have had extensive experience with physical training for girls shows that athletic activities for girls fall into the following groups:

FOR MATURE GIRLS	FOR IMMATURE GIRLS
1. Condemned. broad jump, high jump (in competition), pole-vaulting.	1. Condemned pole-vaulting, running more than 100 yards, weight-throwing
2. Doubtful: high jump, running more than 100 yards (in competition), weight-throwing.	2 Doubtful· basket-ball, field hockey
3 Safe archery, ball-throwing, basket-ball (women's rules), climbing, coasting, dancing, field hockey, golf, horseback riding (cross- and side-saddle), indoor baseball, low hurdles (not in competition), paddling, rowing (not in competition), skating, skiing, snowshoeing, swimming, tennis, walking.	3. Safe· archery, ball-throwing, broad and high jump (not in competition), climbing, dancing, horseback riding (cross-saddle), low hurdles, paddling, rowing, running (not in intense competition), skating, swimming, tennis, walking.
4. Especially beneficial and suitable: dancing, paddling, rowing, running, swimming, walking.	4. Especially beneficial and suitable· climbing, dancing, jumping (in moderation), running (in moderation), skating, swimming, walking
	5. Best loved, most commonly practiced, and with greatest primitive appeal· dancing (greatest unanimity of opinion in this answer).

Development through the Centuries

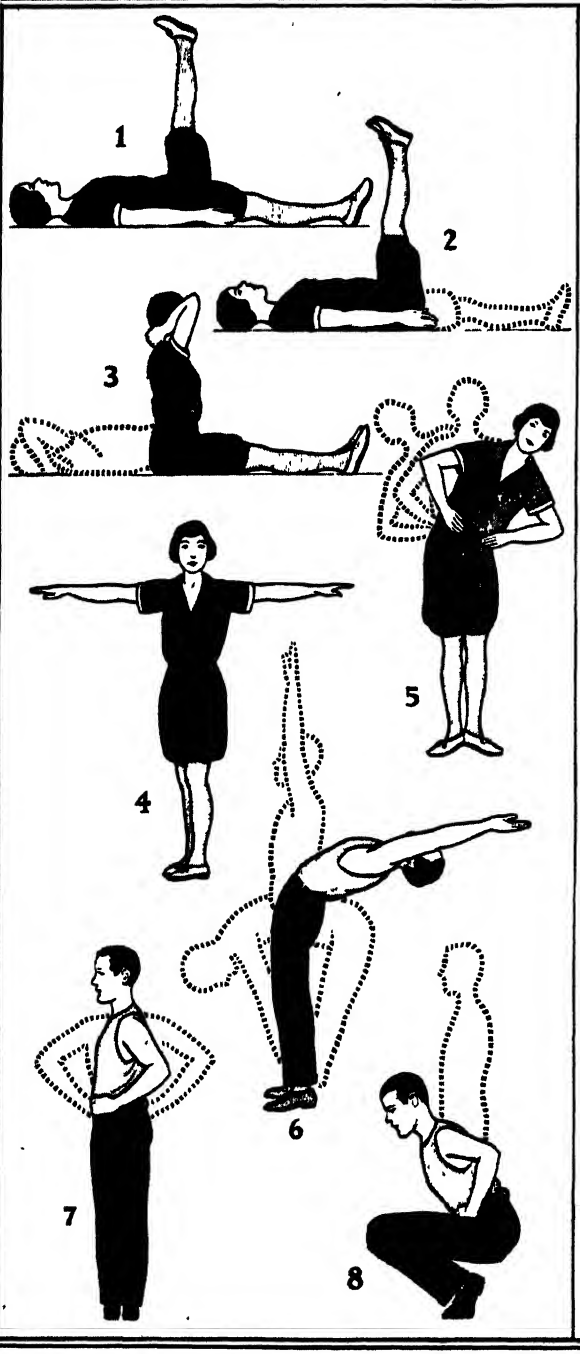
Systematic physical or body training has been employed in some form by most of the races and nations. The reasons for this type of human training have varied; in primitive times and races, intended for training for war, or for religious purposes, or both; in later times and for more civilized nations, intended for recreation, for remedial exercises to prevent or cure forms of human ailments, for esthetic purposes, or as a means of more complete educational training of the human being.

Greece in the Golden Age of Pericles (480 B.C.) was the first nation to develop physical education as a complete program, and to make it a necessary part of the general educational system. Provision in the palestra and gymnasium was made for the exercise of free citizens; in the national festivals, the physical prowess thus gained was exploited before the public.

Greek education embraced two vital subjects, gymnastics and music; the former trained the body and the will; the latter, the intellect and emotions. Sparta and Athens differed in the emphasis they placed on these; Sparta necessarily trained for a nation of sturdy warriors, and Athens aimed at complete and harmonious education and development of the individual.

Turning next to the physical education of the Romans, we find that they lacked the intense love of competition and of esthetic beauty which was so characteristic of the Greeks. Physical education for them served as a means of developing the soldier, as an agency for military purposes.

SIMPLE HOME EXERCISES



Exercise 1. Lie flat on the back. Raise first one leg, then the other, to a perpendicular position. (See Figs. 1 and 2.)

Exercise 2. Raise and lower both legs. Continue until mildly tired. This is an excellent exercise for the abdominal muscles.

Exercise 3. Same position as in Exercise 1. Hands clasped behind the head. Pull up to sitting position. (See Fig. 3.)

Exercise 4. Stand erect, arms outstretched at the side horizontally. Twist to left as far as possible, then twist to the right. (See Fig. 4.)

Exercise 5. Hands on hips. Bend first to right as far as possible. Then repeat to the left. (See Fig. 5.)

Exercise 6. Stretch hands overhead. Bend back as far as possible, repeating until tired. Alternate by bending forward and trying to touch toes. (See Fig. 6.)

Exercise 7. Hands on hips. Twist the trunk around in a circle, first one way, then the other. (See Fig. 7.)

Exercise 8. Hands on hips. Lower the trunk to a squatting position and raise to standing. (See Fig. 8.)

Exercise 9. Tense the muscles of the neck and turn head from side to side, making one set of muscles

in PHYSICAL CULTURE

resist the other in the movement. In the same manner, turn the head forward and back and around in a circle, first to the left, then to the right. This is to develop and strengthen the neck. A large neck indicates power. It insures a good blood supply to the brain. (See Fig. 9.)

Exercise 10. Place the palms of the hands together in front of the breast and press hard. (See Fig. 10.)

Exercise 11. Lock the fingers together in front of the chest and pull one hand against the other. (See Fig. 11.)

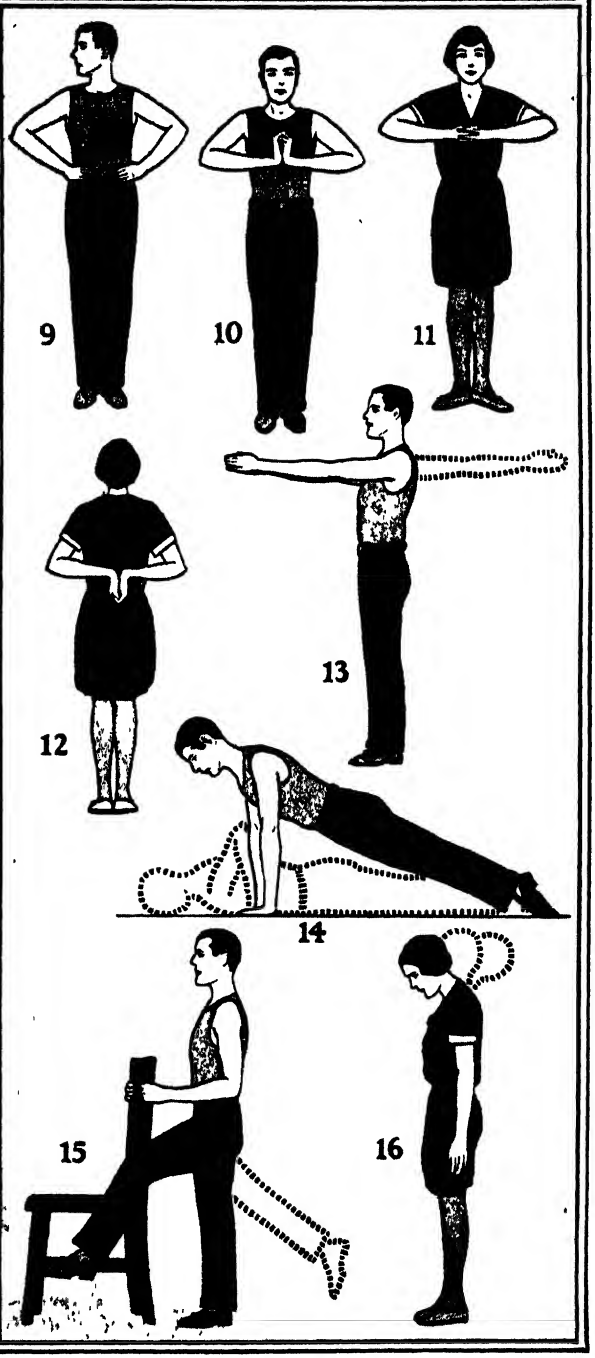
Exercise 12. Lock the hands behind the back and alternately pull one against the other and push them together. (See Fig. 12.)

Exercise 13. Arms outstretched horizontally. Make the hands describe a full circle forward and back. (See Fig. 13.)

Exercise 14. Place the hands on the floor, the body outstretched, face downward. Raise and lower the body from the floor. (See Fig. 14.)

Exercise 15. Hands on back of a chair or table. Raise and lower the knees rapidly, as in running. (See Fig. 15.)

Exercise 16. This is another illustration of exercise 9, more graphically outlined.



From the eleventh to the sixteenth centuries, chivalry, that organization of law and custom relating to knighthood, prevailed throughout Western Europe and struggled against the influence of asceticism. The tournaments and jousts, especially popular during the thirteenth and fourteenth centuries, compare favorably with the Hellenic games, as a demonstration of the athletic and military training and prowess of the knights of that period.

In the transition from the medieval to the modern world, the Revival of Learning was associated with significant changes in physical education. Chief among the Italian humanists of the fifteenth century was Vittorino da Feltre (1378-1446), who incorporated into his school at Mantua, with instruction in classical subjects, instruction in the knightly activities of dancing, riding, fencing, swimming, wrestling, jumping, archery, ball games, etc. He thus succeeded in combining physical with mental training.

It was not until Basedow opened his "Philanthropinum" at Dessau in 1774 that the ideas of Vittorino da Feltre were carried out in practice. In the meantime, however, writers had been busy expounding their theories concerning the justified place of bodily activity in an educational program. Among these were Rabelais, Montaigne, Rousseau, Pestalozzi, Luther, Milton, and Locke.

Johann Basedow (1723-1790), previous to 1774 had been employed in the Soro School for young noblemen in Denmark, as professor of moral philosophy and belles-lettres. Here in the Soro school, in addition to the literary branches, such activities as riding, fencing, and dancing were taught. This institution, established shortly after the appearance of Rousseau's *Émile* in 1762, exerted a strong influence on Basedow's plan for a model school. Thus, when he opened his school at Dessau, we find incorporated in his day's program five hours for study; three hours for recreation, such as fencing, riding, dancing, music, etc.; and two hours for manual labor. Other varieties of exercises were added from time to time, until at the time of the closing of the school at Dessau, in 1793, it is evident that most of the forms of activity which have been advocated since that time had been employed there. These included games and athletic sports, gymnastics, military drill, manual labor, manual training, and school excursions.

Following Basedow as the first pioneer in modern physical education, were Salzmann, with his work at Schnepfenthal, and Gutsmuths, whose lasting fame is probably due more to his two works, *Gymnastics for the Young* (1793) and *Games* (1796), than to his fifty years of teaching.

Friedrich Ludwig Jahn, known as father of popular gymnastics in Germany, was able through his unusual personality and patriotism to promote a widespread interest in gymnastics. Following the opening of the first "turnplatz" at Hasenheide, in Berlin (1811), many such outdoor playgrounds were conducted, based on the principles set forth in Jahn's *Deutsche Turnkunst*, which was published in 1816.

Adolph Speiss, using the fundamental principles of Jahn's teachings, added to them in a way which won for him the title of "founder of school gymnastics in Germany, and of gymnastics for girls in particular." His chief service to physical education was that of making it a part of school life; winning for it recognition as a means of education, to be treated on an equality with all other branches of instruction and discipline. Through his musical gifts, Speiss combined marching, dancing, and rhythmical movement artistically into fixed and organized series which could be executed to the accompaniment of song or other music. This has been since then a conspicuous feature in the teaching of his followers.

In 1814, the Royal Central Gymnastic Institute for the Training of Teachers of Physical Education was opened in Stockholm, Sweden. Pehr Henrik Ling was the originator and first director of this school. Through his influence, instruction was given in three lines of gymnastics—educational, military, and medical. His efforts were to put gymnastics on a scientific basis. Branting, successor of Ling at the Royal Central Gymnastic Institute, brought medical gymnastics to a higher degree of development, while Hjalmar Ling, son of Pehr Henrik, gave to Swedish educational gymnastics its present form, and was responsible for the nature and arrangement of equipment now in common use in many school gymnasiums.

To Denmark belongs the credit of first introducing physical education into its schools as an essential part of the curriculum, and of training teachers through systematic instruction in the theory and method of gymnastics. Franz Nachtegall was the leader in this movement. Though not an inventor of a system of his own, he was an especially good teacher and organizer, using the manuals of Gutsmuths as a guide, and taking the work at Dessau and Schnepfenthal as his examples or models. Denmark, through his untiring efforts, held a leading place in physical education during the early part of the nineteenth century.

During this development of physical education in Germany and Sweden, there was growing up in England, as a feature of its public schools and universities, a great national program of sports and games. While England has been influenced by the systems of physical education in the various countries of Europe, it still remains preëminently the advocate of games as the essential part of physical education.

The progress of physical education in America has been marked by the struggle for a foothold of various physical-education systems introduced from other countries. German gymnastics of the early type were introduced into the United States by three German refugees, Beck, Follen, and Leiber. With Beck as director, the first outdoor gymnasium, a miniature turnplatz, was opened at Round Hill School, Northampton, Massachusetts, in 1825. Follen became director of the first college gymnasium at Harvard University and the first public gymnasium in Boston (1826). Leiber became Follen's successor at the Boston Gymnasium in 1827.

Various systems of physical training were then tried out in America, each backed by enthusiastic advocates, but each failing of general adoption. Among these were the work of Partridge with his military academies; the manual-labor movements, and "calisthenics" for girls and women, as advocated by Catherine Beecher.

Then Dio Lewis appeared about 1860 with his *New Gymnastics for Men, Women, and Children*. In 1861 he launched the first attempt to train teachers in physical education in the Normal Institute of Physical Education in Boston. Dio Lewis, through his enthusiastic teaching, lectures, and writing, made a significant contribution to the early history of physical education in the United States. Besides giving it an impulse, he introduced it into the schoolroom and the home, promoted the idea that physical training is not huge muscle development, and raised the plane of the gymnasium above that of a place for prize fights.

Outstanding in the progress of physical education at this time were the building of the first college gymnasiums at Amherst, Harvard, and Yale; the establishment of the first college chair of Hygiene and Physical Education, at Amherst; the incorporation of military drill and instruction in colleges and universities, according to the provisions of the Land-Grant Act of 1862, and the introduction of Swedish medical gymnastics into a few schools and colleges in the United States.

Following the period of the Civil War, an active interest in games and athletics arose.

The decade from 1880 to 1890 was marked by various interesting achievements in physical education. Among these were the work of Dudley A. Sargent, at the Hemenway Gymnasium at Harvard University; the organization of the American Association for the Advancement of Physical Education, in 1885; the activities of the German-American societies and the North American Turnerbund, in establishing their centers widely throughout the United States, and in establishing their type of gymnastics in various school systems by teachers trained in their normal schools; the organization of a department of physical education in the Y.M.C.A. Training School in Springfield, Massachusetts, with Luther Gulick as head; the Boston conference in the interest of physical training especially as a corrective agency, in 1889; the opening of normal schools for the training of teachers; and a rapid and widespread interest in athletics and games.

Significant developments in the United States since 1900, contributing more or less directly to physical education, were the Folk Dance Movement; the inauguration of the Playground and Recreation Association of America; the organization of the Boy Scouts, Girl Scouts, and additional similar and analogous groups. During this same period, in the first quarter of the twentieth century, compulsory physical education laws of varying scope and defined purposes were enacted in over thirty states.

The survey of the developments of physical education in the United States during the last twenty-five years shows an encouraging movement away from the imitation and adoption of various systems of physical education in other countries, and toward the gradual development of a body of principles of physical education corresponding to the principles, aims, and objectives recognized in the programs of other phases of education. Earlier in this article is given the gradual development of an integral subject and phase of education, with a body of principles, activities, and methods which are being subjected to the same criteria and tests applied to other subjects in the educational programs in elementary schools, high schools, and colleges. T.D.W.

Home Exercises. The practice exercises illustrated in connection with this article on two pages of diagrams will be found helpful to every person. They should be performed a number of times every day.

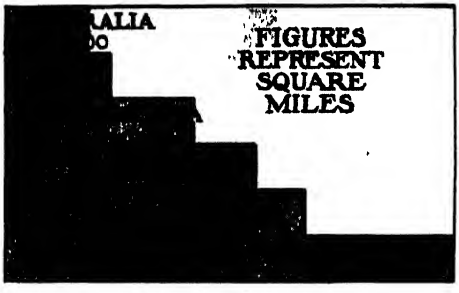
Related Subjects. Other phases of the general subject of physical culture are treated in the following articles in these volumes

Amusements (with index)	Food
Athletics (with index)	Games and Plays
Breath and Breathing	Gymnastics
Calisthenics	Health (with index)
Delsarte System	Health Habits
Education (Hygiene of Education)	Hygiene
	Nutrition
	Play

PHYSICAL GEOGRAPHY. The word *geography* is a compound of two Greek words meaning *earth* and *to write*; the science of geography is, then, broadly speaking, the study of the earth. This is so vast a subject that it has been divided into numerous departments, all of which are described briefly in these volumes in the article GEOGRAPHY. *Physical geography*, or *physiography*, is one of these divisions—the one which deals with the natural

features of the earth, and the changes in its appearance that have taken place and are continuing at the present time. It does not concern itself with political divisions, nor does it usually take up the study of plant life or the investigation of the races of mankind, but it does show how the character of the earth's surface has affected the distribution of life, and what effect natural conditions have had on man's progress.

Physical geography treats first of the earth as a whole—its shape, size, movements, relation



APPROXIMATE SIZES OF THE CONTINENTS

to other bodies in the solar system, and its structure. The atmosphere, which envelops the globe on all sides, is another division of this branch of geography. Included in this division is the study of the composition of the air, its pressure and elasticity; the effects of variations in temperature; the movements of the air; the seasons, zones, storms, rainfall, snow, and kindred topics. The land and water envelopes of the earth are also studied in detail in physical geography. This science treats of the depth and area of the various ocean divisions, of the color, temperature, and composition of ocean waters, of currents, tides, and waves, of the contour and characteristics of the ocean floor, and of the formation of continental shelves. Seas and lakes are also studied. In taking up the land surface of the globe, one would study the character, location, and formation of continents, plains, plateaus, mountains, rivers, valleys, and islands. At all times, through the work of heat, atmosphere, and running water, and through other agencies, the appearance of the earth is undergoing many changes. It is the province of physical geography to investigate and classify the forces of change and to study their effects. R.H.W.

Related Subjects. The scope of this branch of geography is indicated by the numerous topics directly related to it, and the reader is referred to the section *Physical Geography* in the list of related subjects following the article GEOGRAPHY.

PHYSICALLY DEFECTIVE CHILDREN. See CHILD, subhead.

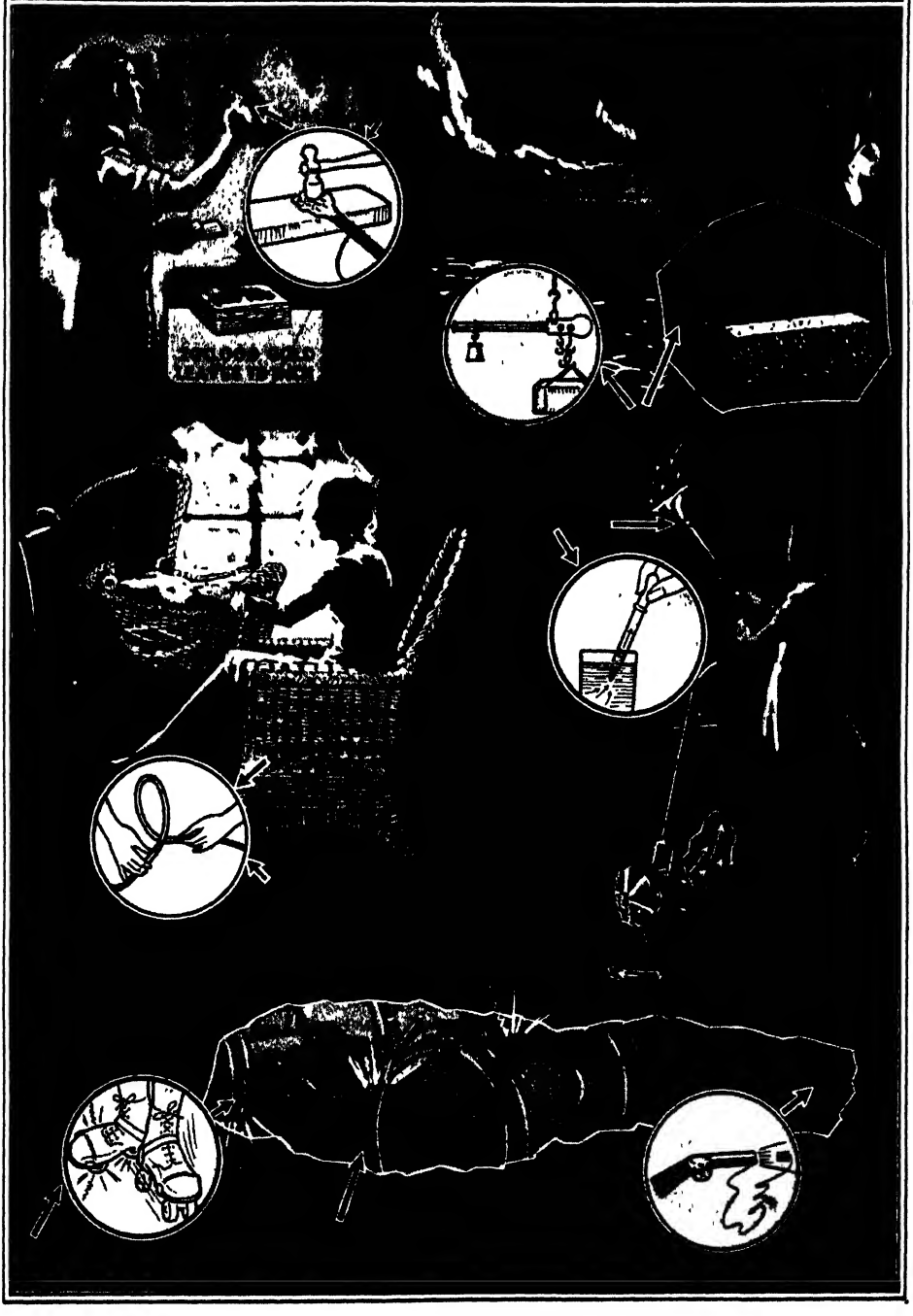
PHYSICS, *fiz' iks*, the science that tells us the "why," "how," and "how much" of most of the things we see about us in our daily lives. It is often described, more formally, as the science of matter and energy, but this definition does not clearly set it apart from other branches of science, such as chemistry, astronomy, or geology. Before the modern period, in fact, all of these sciences of things inanimate were considered subdivisions of *natural philosophy*, just as the study of plant and animal life made up the science of *natural history*. With the growth of scientific knowledge, a more definite classification seemed necessary, and rather rigid distinctions were erected between the sciences having to do with inorganic phenomena. Now the tendency is to emphasize the underlying relationship that connects all branches of science, for, as the newest discoveries are bringing men closer to an understanding of the nature of matter, the sciences are seen to overlap and interlock, and progress in each field of inquiry has a reaction in every other field.

There are five subjects, however, that properly are included in the study of physics, though we cannot say that they all belong rigidly to physics alone. These are *mechanics*, the study of motion, force, and the mechanical properties of matter; *acoustics*, the study of sound; *thermotics*, the science of heat; *optics*, the study of light; and *electricity and magnetism*. In the study of these subjects, we find the answers to the questions mentioned at the beginning of this article, for at every point of contact with the world about us, we see applications of the laws of physics.

What We Learn from Physics. Physics tells us why we see the lightning flash before we hear the thunder; why we instantly hear the announcer's voice through a radio set, though he is a thousand miles away; why we lose our balance in a street car when it stops suddenly; how the light of distant stars becomes visible to us; how much gasoline is needed in the tank for the automobile to run; why the wires in an electric toaster grow hot enough to toast the bread, while the connecting cord remains cool. The housewife comes in contact with laws of physics when she uses the vacuum cleaner, turns a clothes wringer, hangs the wet clothes in the sun to dry, and puts yeast in bread dough. The young people are depending on the principles of physics when they dance to the music of the phonograph or attend the moving pictures. The farmer is making use of physical laws when he pumps water with a gasoline engine, separates cream and milk in a centrifugal machine, or calls his neighbor on the telephone. So it is that the human race is dependent upon its knowledge of physical laws for all material things, from the simplest necessities to the luxuries made possible by wonderful inventions.

The Progress of Physics. Physicists have gone from one discovery to another through

How Man Uses Knowledge of Physics



QUESTIONS ON PHYSICS

Why does salt harden, or cake, in damp weather?

When you pour water slowly out of a pitcher, why does it tend to run down the outside of the vessel?

All freely falling bodies fall with the same speed. Why, then, does a piece of iron seem to fall faster than a stick of wood?

What keeps us from being crushed by the weight of the air?

Why is it easier to lift a stone under water than above it?

Why does food cook more rapidly in a double boiler if salt is placed in the lower vessel?

What causes ink to soak into a piece of blotting paper?

Why is the end boy likely to be thrown when you play crack-the-whip?

What keeps an automobile from skidding when it turns around a corner?

Why does a punctured tire explode?

Why can you smell the fragrance of a bouquet of flowers in all parts of a room?

Why can you hear only the last word of a sentence sent back as an echo?

What makes a rubber ball bounce?

Explain why fanning cools you.

Why does bread dough rise when put into an oven?

Why does a blacksmith use a bellows on his forge fire?

Explain the operation of an ice-cream freezer.

Why can you skate on ice and not on glass?

If a railroad train has smooth steel wheels and the track is smooth steel, why do not the wheels spin around without moving the train?

How does a fireless cooker work? A thermos bottle?

How is it possible to make artificial ice?

Could water in a pipe flow over a hill if the top of the hill were higher than the source of the water?

With two pieces of water pipe, one ten times the diameter of the other, how could you make a machine that would enable you to raise a weight of one thousand pounds with ease?

Why does a baseball thrown into the air travel in a curve?

Why does a door make a noise when it slams?

Why does a paddle look bent at the point where it enters the water?

Why does oil flow faster if you take the cap off the top of the can?

Why is a jerk more apt to break a string than a steady pull?

Why is it hard to open a door if you push near the hinged side?

Why do pieces of paper float upward from a bonfire?

Why do tall books tip over easily?

observation and experiment. Galileo, who discovered the laws of the pendulum; Newton, who formulated the universal law of gravitation; Faraday, the pioneer in the realm of electromagnetism; Maxwell, the expounder of the modern theory of light—these and many others laid a magnificent foundation for present-day physicists by painstaking research and reliance on their belief in a physical world that is governed by law and order.

As the nineteenth century drew to a close, it was believed that the fundamental principles of physics had been fairly well established. How mistaken was this belief may be realized from a review of the marvelous advance that scientists have made since Roentgen announced his discovery of X-rays in 1895. A new theory of the nature of matter has been developed, and even the time-honored theory of gravitation is seriously questioned by one school of thought. The following summary gives some of the discoveries and theories that have revolutionized physics (and other sciences as well):

1. The discovery of X-rays and of radioactivity.

2 The proof of the electronic theory of matter and electricity through the study of the radiations emitted by radioactive elements.

3 The development of the nuclear theory of the atom, which modern experimentations constantly tend to affirm.

4. The development of the quantum theory, namely, that radiation of energy from any body is a discontinuous process, each elementary radiator emitting energy in equal amounts called *quanta*.

5. The announcement by Einstein of his general theory of relativity, and his statement that light is subject to the effect of gravitation, also, his unitary-field theory, that all forms of energy are aspects of one universal force

These items merely indicate the highlights of the amazing advance in scientific knowledge, and the reader will find the details covered in the special articles on the subjects. The article CHEMISTRY, in particular, contains a connected account of the modern theory of atomic structure. At this point, physics and chemistry overlap, and distinctions are lost. A.L.F.

Related Subjects. The comprehensive scope of the subject of physics as treated in these volumes is indicated by the following list of topics. Reference should also be made to the list following the article MACHINE.

Aberration
Absorption
Acoustics
Adhesion
Air
Artesian Well
Atom
Attraction
Block and Tackle
Boiling Point
Calorie
Candle and Candle Power
Capillarity
Centigrade
Centrifugal Force
Centripetal Force
Cohesion
Color
Composition of Forces
Compressed Air
Cosmic Rays
Density
Diffraction
Diffusion
Distillation
Ductility
Dynamics
Dyne
Echo
Einstein's Theory
Elasticity
Electricity (with index)

Energy
Ether
Evaporation
Expansion
Extension
Falling Bodies
Flame
Flexibility
Fluorescence
Foot-Pound
Force
Fountain
Freezing
Friction
Gravitation
Gravity, Center of
Gravity, Specific
Hardness
Harmonics
Heat
Horse Power
Hydraulics
Hydrostatics
Ice
Inclined Plane
Inertia
Kinematics
Lens
Lever
Light
Liquid
Liquid Air
Magnet and Magnetism
Magnetic Needle
Malleability
Matter
Mechanical Powers
Mechanics
Melting Point
Mirror
Molecule
Momentum
Osmosis
Parallelogram of Forces
Pendulum
Penumbra
Perpetual Motion
Phosphorescence
Photometry
Pneumatics
Polarization of Light
Porosity
Pulley
Quantum Theory
Radioactivity
Reflection
Regelation
Roentgen Rays
Screw
Shadows
Siphon
Siren
Solid
Solution
Sound
Spectrum Analysis
Spring
Statics
Steam
Sublimation
Temperature
Tenacity
Thermometer
Torsion Balance
Vacuum
Vapor
Velocity
Wedge
Weight
Wheel and Axle
Windlass

The following eminent physicists are given special treatment in these volumes

Arago, Dominique F.
Archimedes
Bacon, Roger
Bunsen, R. W. E
Curie, Pierre and Marie
Edison, Thomas A.
Fahrenheit, Gabriel D.
Faraday, Michael
Foucault, Jean B. L.
Galvani, Luigi
Gay-Lussac, J L.
Guyot, Arnold
Helmholtz, Hermann von
Herschel (family)
Kelvin, Baron
Michelson, Albert A.
Millikan, Robert A
Morse, Samuel F. B
Newton, Sir Isaac
Roentgen (subhead under Roentgen Rays)
Tesla, Nikola
Torricelli, Evangelista
Volta, Alessandro
Watt, James

PHYSIOGNOMY, *fiz ih og' no mie*, a pseudo-science which attempted the specific task of reading traits of character in bodily signs. It became a pseudo-science by far overstepping the bounds within which such relations might be moderately suggestive. In the treatise on the subject attributed to Aristotle, the essential doctrine is found. Such qualities as timidity, impudence, courage, and anger are associated with color, hair, form of body, length of limb, gait, voice, etc. Persons with thick, bulbous noses are insensitive; those with sharp-tipped ones, irascible; those with slender, hooked noses, noble but grasping, etc. Animal analogies were common. A person with a nose like an eagle's beak was put down as having the qualities of an eagle, the one whose appearance suggested an owl was wise, and he who looked like a crow was pert.

Rash generalization, on the basis of weak analogy (and supported by a certain amount of shrewd observation), is all that underlies the system. It continued irregularly as part of "occult" lore and popular belief, and at times received additions from, and was affiliated with current systems of interpretation. An astrological physiognomy was formed by associating each of the lines of the forehead with a planet and interpreting the depth and prominence of the line in terms of the moral quality associated with the planet. The notion persisted that animal qualities (the courage of the lion, the timidity of the deer or hare, the stupidity of the ass or sheep, the cunning of the fox, the farsightedness of the eagle) would be possessed by those whose heads and features suggested the one or other animal peculiarity; and some attempt was made to generalize such qualities; for example, long-haired creatures were courageous, and short-haired were timid.

This body of doctrine, never very important, was revived by Lavater's sumptuous publications written in popular style and richly illustrated. Lavater relied purely upon his impressionistic sense; he noted prominent features among his friends and associated them with prominent qualities; he studied the faces of great men and proved to his own satisfaction that every feature of the head of Voltaire showed wit and satire. He associated certain shapes of brows, of nose, of mouth, of ear, of chin, with benevolence, cupidity, ambition, quick temper, firmness, etc., and made his analysis more and more detailed and refined. His descriptions were enthusiastic rhapsodies of the qualities of the persons illustrated, and of the nicety with which their features revealed their traits. No true verification was attempted; and his attempts to read the character of heads failed when the personality was unknown.

As practiced by Lavater, physiognomy becomes a convincing example of the worthlessness of generalizations founded upon a mere impression, and, still more, of the readiness with which a worthy enthusiast can deceive himself, and make others believe that such unfounded conclusions rest on fact. Prepossession, delusion (that is, unconsciously making the features fit the known qualities of the subject), along with a shrewdness in the interpretation of human nature which sympathetic experience brings—such is the basis of physiognomy. But, in the hands of quacks, physiognomy was mingled with all sorts of "occult" lore and fortune telling, and its distorted vestiges may be found in the cheap handbooks that instruct the credulous how to read character and command fate.

The true scientific view of the meaning of features and expression began with the treatise of Sir Charles Bell (1806), and was markedly advanced by the work of Darwin (1872), who showed that the expressions of the emotions were associated serviceable habits, once really useful, and now refined miniatures, suggestive of their ancient service. Thus we sneer and raise the lip, while the dog snarls and shows his teeth as a threat. Naturally, the tendency to assume certain types of expression, notably fear and anger, may give a set to the features. Stern, harsh expressions are contrasted with gentle and kindly ones. The human features, in terms of expression, contain a most interesting story; but the spirit of inquiry that led to their decipherment is wholly opposed to that which favored the pseudo-scientific notions of physiognomy. J.J.

Related Subjects. The following articles, while not bearing on physiognomy, are of interest in this connection, as many of them deal with various aspects of the pseudo-sciences:

Alchemy	Necromancy
Astrology	Occult
Clairvoyance	Palmistry
Conjuring	Phrenology
Divination	Psychical Research
Faith Cure	Psychoanalysis
Hypnotism	Spiritualism
Magic	Suggestion
Medium	Superstition
Mesmerism	Telepathy
Mind Reading	Witchcraft

PHYSIOGRAPHY, *fiz ih og' rah fie,* a term scientifically employed to cover the entire range of physical geography. It is explained under that title. See, also, GEOGRAPHY (Physical Geography).

PHYSIOLOGICAL CHEMISTRY. See BIOCHEMISTRY.

PHYSIOLOGY, *fiz ih ol' o jie.* Human physiology is a study of the functioning of the various organs of the body. It studies not only the relations of the functions of the organs to one another, but also it studies the effect of outside environment upon the organs of the body. In other words, a study of physiology makes clear to us the mechanisms by which we live. It tells us how we are able to move about and see and eat and react to heat and cold, and, in general, do the myriad things that make up our everyday existence. The study of anatomy tells us of the structure of the various organs of our body; physiology tells us how these organs work. Thus we see that anatomy and physiology are two of the most fundamental sciences in the study of the human body, and that one is not complete without the other.

The study of physiology and hygiene in the public schools is required by law in many countries. Every person should have a knowledge of the elementary facts and principles of this science, for the following reasons:

1. Every one, for his own good, should possess such a knowledge of physiology as is necessary to lead him to live intelligently in accordance with the laws of health.

2. A community must rely upon a knowledge of physiology and hygiene by its members for the enactment and enforcement of such sanitary measures as are necessary to the public health.

3 A knowledge of the injurious effects of stimulants and narcotics is necessary to prevent abuses in their use.

The early history of physiology is obscure, but we know that for many centuries the practice of medicine was founded more upon tradition and superstition than upon scientific facts. Gradually, however, superstition gave place to scientific knowledge. Modern physiology began with the discovery of the circulation of the blood by William Harvey in 1628, since this discovery worked a revolution in most of the accepted theories then underlying medical practice. The next great discovery was that of the lymphatic system, in 1651. Since the discovery of the cell structure of tissues, physiological science has made rapid advancement. This progress is recorded in the articles relating to physiology. See page 5599. K.A.E.

Related Subjects. At the close of the article ANATOMY is given a list of the topics in these volumes which relate to physiology and anatomy No attempt is made to separate physiological from anatomical topics, as the two subjects are very closely related The reader is also referred to the articles EVOLUTION, DISEASE, MEDICINE AND DRUGS, and SURGERY, IN connection with which will be found index lists of many topics more or less closely related to the general one of physiology.

PHYTELEPHAS, *fi tel' e fas,* the tree which produces the nuts of vegetable ivory. See ECUADOR (Physical Features and Climate).

PI. See CIRCLE (Relation of Circumference to Diameter and Radius).

PIA MATER, *pi' ah ma' tur.* See BRAIN.

PIANISSIMO, *pe ah nis' ih mo,* or *pyah-nees' se mo.* See MUSIC (A Course of Lessons: Common Musical Terms).

PIANO, *pih ah' no,* a term denoting degree of intensity. See MUSIC (A Course of Lessons: Common Musical Terms).

PIANO, OR PIANOFORTE, *pih an o for' tay* (or *fort*), the basic musical instrument. It shares with the organ and the harp the distinction of producing the major elements we call music—the others play *melodies.* Owing to this basic fact and the ease with which the piano can be played, it is generally used as the medium for the study of music, either vocal or instrumental, more widely than any other. The name *pianoforte,* given by its Italian inventor, Bartolommeo Cristofori (1665-1731) means *soft and loud.* In 1709 he created the pianoforte (in "grand" form) from the ancient harpsichord (which see). In the more than two centuries since that date, there have been many marked improvements. An English civil engineer named John Isaac Hawkins, who was

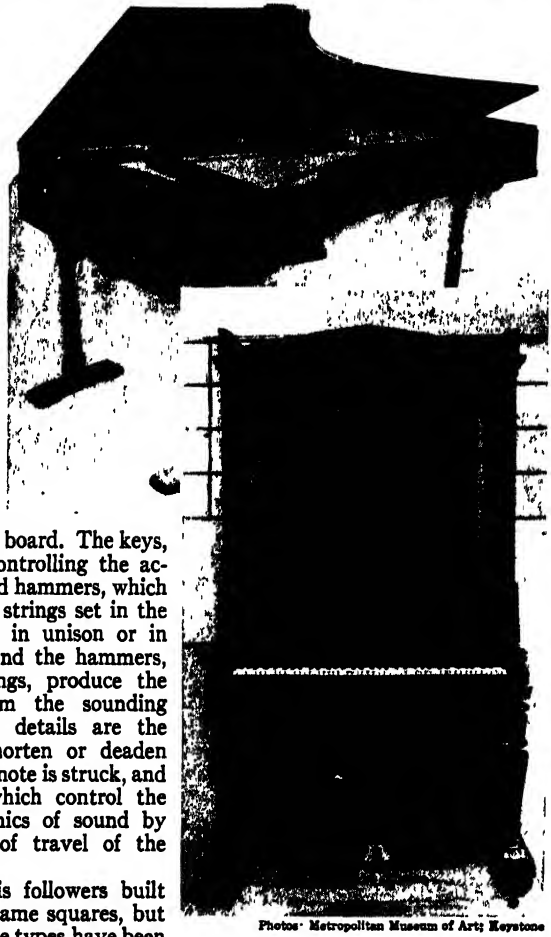


The Most Wonderful and the Most Complicated Chemical Factory in the World. However, at market prices, the constituent elements of a human body weighing two hundred pounds assay about ninety cents in value. See PHYSIOLOGY.

long a resident of Philadelphia (Pa.), designed a full iron plate, on which he obtained United States and British patents in 1800. Hawkins also patented in 1800 an upright piano which he called a portable grand. Nearly a quarter of a century later, an American, Jonas Chickering, made the full iron plate mechanically practicable. This great improvement not only permitted longer strings and higher tension, with far greater tone color, but added immensely to the tonal power of the piano, raising it to orchestral volume, and ensuring its ability to stay in pitch.

The piano mechanism is composed of keys, action, strings, plate, and sounding board. The keys, which are levers controlling the action, move the felted hammers, which rebound upon wire strings set in the same axis (usually in unison or in groups of three); and the hammers, striking these strings, produce the tone reflected from the sounding board. Important details are the dampers, which shorten or deaden the sound after the note is struck, and the foot pedals, which control the quality and dynamics of sound by changing the arc of travel of the hammer.

Cristofori and his followers built grands only; then came squares, but for many years, three types have been popular—grands, uprights, and player pianos (see below). In length, the grands are made from three feet eight inches to nine feet, the standard concert size. The present American taste for uprights calls for instruments from three feet to about four feet four inches in height; there are variations to suit racial tastes or educational requirements. The keyboards of the conventional-size piano and of all concert instruments usually contain eighty-eight notes, or 7⅓ octaves. This keyboard size is arbitrary, however, and where space is limited, often is greatly cut down. Much attention has been given of late years to beauty and harmony of case designs, which are usually finished in veneers of many rare woods of great beauty, varnished, lacquered, or waxed. Both grands and uprights in any of the usual "schools" or decorative periods are now made as regular lines at attractive prices.



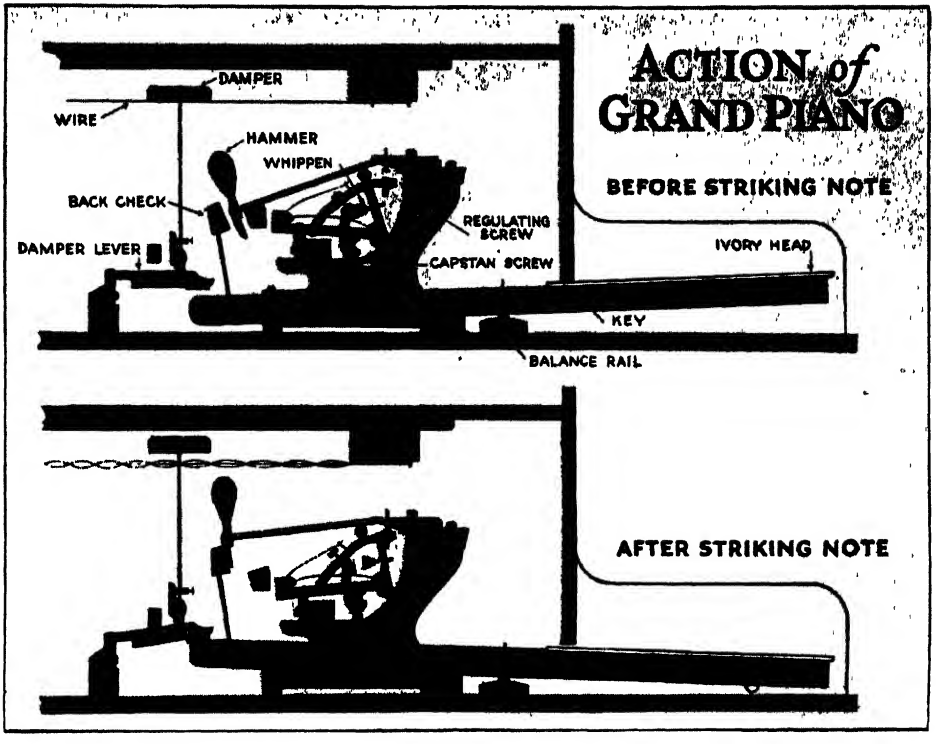
Photos: Metropolitan Museum of Art; Keystone

PRESENT-DAY PIANOS DEVELOPED FROM THESE

Above, illustration of what is claimed to be the world's oldest piano It was built by Bartolommeo di Francesco Cristofori in 1720, in Italy, and is now in the Metropolitan Museum, New York City. Below, a piano built in 1835 by Chickering

The United States, which has long led the world in output, excels in art-model (period) pianos, as well as in stock designs, and produces several hundred thousand pianos each year, with many player pianos, this type being a favorite in homes where none of the family can play the piano manually. Canada, England, Germany, France, and other European countries have many factories, and Australia, China, and Japan also make pianos for their local markets.

Player Piano. This instrument represents a conversion of the hand-played piano into a mechanism which plays music from perforated rolls. A French inventor, Henri Fourneaux, exhibited a self-playing piano at the Philadelphia Centennial Exposition in 1876, and the testimony of auditors is that it gave a creditable performance. But it was not until the closing years of the nineteenth century that American manufacturers gave their attention to "players." The first form was a cabinet which could be pushed up to the keyboard or removed when the piano was played manually, but this bulky device soon gave way to a player mechanism within the piano case itself. The full range of eighty-eight notes is generally used, and any class of piano music can be produced, some 15,000 compositions having been arranged for the rolls. In some



cases, the greatest of living pianists have recorded for these rolls their own interpretations of musical classics.

Player pianos come in two types, those actuated and modulated by electric control, and those employing the more widely used form of foot-pedal mechanism. The latter use the perforated rolls, but the individual operating the instrument can impart his own interpretation in tempo, nuance, and dynamics of the composition, the mechanism itself ensuring accuracy of note combination and time sequence. The player mechanism itself consists of an individual pneumatic for each note, and bellows, which are the power plant of the instrument, to be operated either by the electric motor or by foot pedals. The perforation in the rolls, passing over the voice board, induces individual pneumatics to strike the corresponding note hammers within the case. As the rolls are in plain view of the operator and accurately marked to indicate the tempo as well as the dynamics, the composition can be played with as close an approximation to a good professional performance as the operator's musical aptitude permits. The re-winding and ease of replacement or repetition of any desired phrase, combined with the practically complete library of the world's music (15,000 compositions of all kinds) obtainable on these rolls, make the player piano a great cultural influence in homes where none of the family can play a piano manually. Player pianos are made in Europe as well as in the United States, but the typical American mechanism is generally conceded to be the best of its kind, and these instruments have accordingly been sold all over the world. F.W.K.


Photo: Keystone
JONAS CHICKERING

PIASTER, OR **PIASTRE,** *pih as' tur*, an old name for the Spanish dollar. The "pieces of eight" which the pirates of the "Spanish main" are supposed to have buried, and with the discovery of which historical romancers ever since have busied themselves, were the eight-*real* pieces, or piasters. The term is no longer used in Spain.

In Turkey, in 1916, a reform of the currency was ordered, and a gold standard was instituted, with the piaster as the unit. According to the order issued at that time, the

piaster is equal to forty para; in United States money, it is worth at par about $.044. Nickel one-piaster coins and silver coins of two and one-half, five, and ten piasters are in circulation. See MONEY (Foreign Monetary Standards); LIRA; DOLLAR.

PIAVE, *pe ah' vay,* **RIVER.** See WORLD WAR (Events on Land in 1917: Italian Reverses).

PICA, *pi' kah.* See TYPE.

PICADOR, *pik ah dore'.* See BULLFIGHTING.

PICASSO, *pe kahs' so,* PABLO. See CUBIST SCHOOL OF PAINTING.

PICCALILLI. See PICKLES.

PICCOLO, *pik' o lo,* a small flute having a pitch an octave higher than that of the ordinary concert flute (see FLUTE). The music of the piccolo, however, is written an octave lower



THE PICCOLO

than the notes are sounded, for convenience of composition. The orchestral effects of imitating the whistling of the wind or the rustling of the leaves are admirably produced by the instrument, which is generally in the key of *D.* In some orchestras, the flute-player alternates in using flute and piccolo, but large modern organizations usually have a separate player for the smaller instrument. Its compass is nearly three octaves. An organ stop, the tone of which resembles the sound of this small flute, is also known as piccolo.

PICKEREL, *pik' ur el,* the name applied to three smaller species of the pike family. Like all pikes, they have large mouths and voracious appetites, and are stubborn fighters when



THE PICKEREL

caught with a hook. All are fresh-water fish, and a distinguishing feature is the presence of scales on the cheeks. The three species are the *banded pickerel,* occurring east of the Alleghenies from Massachusetts to Florida; the *little pickerel,* found abundantly in the Mississippi Valley; and the *common eastern pickerel,* which is a habitant of lakes and streams east and south of the Alleghenies, from Maine to Florida and west to Arkansas. The banded and little pickerels, which are not more than a foot in length, are too small to be important food or game fishes, but the eastern pickerel is a good game fish, and is much sought by sportsmen. Its flesh is very palatable. L.H.

Scientific Names. The species mentioned above are members of the genus *Esox,* and are known as follows: banded, *E. americanus;* little, *E. vermiculatus;* common eastern, *E. reticulatus.*

PICKERING, JOHN. See IMPEACHMENT.

PICKETING. See STRIKE.

PICKETT, GEORGE EDWARD (1825-1875), the Confederate general who led "Pickett's charge" on Cemetery Ridge at the Battle of Gettysburg. The hill was the key to General Meade's position. Under an extremely severe fire, Pickett's division stormed the hill and succeeded in entering the enemy's lines, but, left without support, the men were compelled to fall back, broken and almost annihilated. This charge is said to have been the most brilliant feat of arms performed on any Confederate field.

General Pickett was born at Richmond. After graduating from West Point, he served in the Mexican War as a lieutenant, and later fought on the Western frontier against the Indians. When the War of Secession broke out, he resigned from the United States army to become colonel of the state forces of Virginia. After the Peninsular Campaign, during which his division gained renown as the "game-cock brigade," he was made a major general. Toward the close of the war, he rendered brilliant service in the defense of Petersburg. After peace was declared, he returned to Richmond, where he engaged in business for several years. See GETTYSBURG, BATTLE OF.

PICKFORD, MARY. See MOVING PICTURES (list of players).

PICKLES, *pik' l'z,* are fruits and vegetables preserved in vinegar and used on the table to stimulate the appetite and to add spiciness and flavor to the meal. Vegetable pickles are made chiefly from cauliflower, cucumbers, tomatoes, gherkins, onions, mushrooms, and nasturtiums (seed pods and flower buds). There are innumerable variations in preparing the different pickles, but the standard method of making the popular unripe cucumber pickles (gherkins) is a good type.

The recipe for making a peck of these pickles calls for a quart of pickling onions. The gherkins are first of all cleaned very carefully. They are then placed in brine with the peeled onions and allowed to stand for twenty-four hours; the mixture is then drained, and the pickles are packed in clean jars, chopped red and green peppers having been added.

Vinegar (two cupfuls of pure cider vinegar to each quart of pickles), brown sugar, and spices (cloves, allspice, mustard, cinnamon) are placed in a saucepan and boiled for five minutes, and the resulting liquid is poured hot over the pickles. Before the jars are sealed and put away, the pickles must be left in a warm place for twenty-four hours, hot vinegar being added now and then to make up for shrinkage. If the vegetables used are naturally soft, cold vinegar

is preferred by some, as hot vinegar tends to soften the pickle. After the jars are sealed, it is a good idea to let the pickles stand for two months before serving them

The careful housewife and the honest manufacturer will take pains not to use vessels made of metal, either in making or storing pickles, for the brine and vinegar are liable to form a poisonous deposit by corroding on the metal, and thus injure the pickle. Boiling vinegar in copper vessels causes a green salt to form, a poisonous substance which colors the pickles green. Unscrupulous dealers sometimes purposely color their product in this way. A harmless, though somewhat difficult, method of coloring the pickles green consists in steeping vine, cabbage, spinach, or parsley leaves in the vinegar.

Indian pickle, or piccalilli, is a popular relish consisting of a mixture of pickled cucumbers, onions, cauliflower, and spices, the vegetables being finely chopped. Chowchow, similar to it, consists of tomatoes, onions, green peppers, cinnamon, allspice, cloves, peppercorn, mustard, salt, and horseradish. The popular dill pickle is a cucumber pickle flavored with the herb known as dill. Excellent sweet pickles are made from cherries, plums, peaches, pears, apples, and grapes, and from many vegetables. The sugar used in making sweet pickles causes them to have a duller shade of green than the sour ones.

Pickles are excellent for relieving the monotony of a meal, and for making more palatable any insipid foods that may be served, but it is worthy of emphasis that they must be eaten in great moderation, for they are not easy to digest. A pickle, however, is more digestible than the raw vegetable from which it is made, for vinegar tends to dissolve meat and vegetable fibers. Pickles contain a high percentage of water and small amounts of protein, fat, and carbohydrates, and are stimulating rather than nutritive [see FOOD (Chemistry of Foods)]. E.V.M'C.

PICKTHALL, MARJORIE. See CANADIAN LITERATURE (English Canada: Fiction).

PICKWICK, *pik' wik,* **PAPERS,** a story by Charles Dickens, published serially in 1836-1837. Its original title was *The Posthumous Papers of the Pickwick Club,* but it is universally known to-day by the shorter name. With the exception of the brief *Sketches by Boz, Pickwick Papers* was Dickens' first work, and it is in some ways his best. It attempts to tell no real story, and the original idea of a club on its travels becomes but a thread connecting scores of incidents that are grotesque, dramatic, and pathetic by turns. In no other work is Dickens' humor so free and so riotous. Sam Weller, Tony Weller, with his marital difficulties, Mrs. Bardell and her friends, Sergeant Buzfuz, Joe the fat boy—these are but a few of the characters who are a permanent source of amusement to all who have once made their acquaintance. Perhaps there is no other character in all of Dickens so well known as Sam Weller, whose appearance in the fifth number raised the *Papers* from comparative failure to such popularity as no story before published in England had ever attained. See DICKENS, CHARLES.

PICO DE ANETO, *pe ko' da ah na' toh.* See SPAIN (The Land).

PICRIC, *pik' rik,* **ACID,** a yellow crystalline solid formed by the action of strong nitric acid on carbolic acid. Picric acid colors the skin and animal fibers yellow, but as it will not color vegetable fibers, it is a good test for fabrics suspected of containing cotton. Formerly, it was used in dyeing silk yellow, but for that purpose it is now replaced by vegetable dyes. Its most extensive use is in the manufacture of explosives. See EXPLOSIVES; FULMINATION. T.B.J.

Chemical Formula. The formula for picric acid is $C_6H_2OH(NO_2)_3$. A molecule contains six atoms of carbon, two of hydrogen, one hydroxyl group (*OH*), and three nitroxyl, or nitro, groups (NO_2) These groups are, respectively, associated atoms of oxygen and hydrogen and of nitrogen and oxygen, which remain unaltered in chemical reactions

PICTS, *pikts,* an ancient people of Scotland whose modern descendants are represented by some of the inhabitants of Southern Wales and Western Ireland. Nothing certain is known of their origin. The first historical reference to them occurs in a speech made by a Roman orator in A.D. 297. For years the Picts carried on warfare with the Romans and the Teutonic invaders of Britain, the Angles and Saxons. About the eighth century, they disappeared as a separate race.

Derivation of Name. The name, from the Latin *pictor,* meaning *painter,* was given the Picts by the Romans because of their custom of staining or tattooing their skins. C.W.

PICTURE STUDY. See LANGUAGE (Second Year); PAINTING, subhead.

PICTURE WRITING. See ALPHABET.

PIDGIN, *pij' in,* **ENGLISH.** See ENGLISH LANGUAGE, subhead.

PIECES OF EIGHT. See PIASTER.

PIEDMONT, *peed' mont,* a beautiful and fertile section in the northern part of Italy, now constituting a territorial department of that country. Switzerland adjoins it on the north, France lies to the west, and the Italian departments of Liguria and Lombardy bound it on the south and east. Piedmont is the upper valley of the Po River. Its name, meaning *foot of the mountain,* refers to its situation at the base of the high Alpine ranges that enclose it on all sides except on the south. It is 11,331 square miles in area, and consists of the six

provinces of Alessandria, Aosta, Cuneo, Novara, Torino (Turin), and Vercelli. In this fertile region agriculture is an important industry, and considerable manufacturing is carried on in the towns and cities (see ITALY). Piedmont was formerly a part of the Sardinian kingdom (see SARDINIA, KINGDOM OF). Population, about 3,528,000

PIEDMONT REGION. Named for the district in Italy that lies at the base of high Alpine ranges (see preceding article), the Piedmont region, or plateau, of North America is an extensive area of broken and hilly land stretching east and southeast of the Appalachian Mountains and between those mountains and the Atlantic coastal plain. The division between the Piedmont and the plain is sharply marked by the line of fall for the rivers that flow toward the sea. Along this line, streams from the west leave the harder, rocky ground adjacent to the mountains and cross the softer, more easily trenched coastal plain. In Georgia and other states, the fall has determined the location of several cities. The portion of the Piedmont plateau lying in New England is broad, but is less sharply marked off from the coastal plain than the hilly region farther south. It reaches its greatest breadth in North Carolina, where it extends 300 miles from the mountains. The underlying rocks were once worn away, almost to a plain, by erosion, but were lifted in a later upheaval. In places the Piedmont region is very fertile. In Virginia, especially, it is well adapted to the raising of apples.

Related Subjects. Additional information on this topic will be found in the articles PLAIN (Coastal Plain); FALL LINE; and GEORGIA (The Land).

PIED, *pide,* **PIPER OF HAMELIN.** In the town of Hamelin, Germany, in the year 1284, there once lived a strange man who, so legend says, charmed away the rats which were destroying the food supplies of the town. Robert Browning immortalized the legend in a poem wherein he thus describes the power of the Pied Piper:

"I'm able
By means of a secret charm, to draw
All creatures living beneath the sun,
That creep or swim or fly or run,
And after me so as you never saw;
And I chiefly use my charm
On creatures that do people harm,
The mole and toad and newt and viper;
And people call me the Pied Piper."
And here they noticed round his neck
A scarf of red and yellow stripe,
To match with his coat of the self-same check;
And at the scarf's end hung a pipe,
And his fingers, they noticed, were ever straying
As if impatient to be playing
Upon his pipe as low it dangled
Over his vesture so old-fangled.

But after the great hordes of rats came tumbling out of houses to follow the Pied Piper to their doom in the river Weser, the mayor and the councilors refused to pay the promised price agreed upon with the Pied Piper. Again he blew three notes on his long pipe, "such



Photo Visual Education Service

THE PIED PIPER
[From the painting by Kaulbach.]

sweet soft notes as yet musician's cunning never gave the enraptured air." In this way he lured the children of Hamelin into the mountain fastnesses, never to return.

The inspiration for the Pied Piper legend is said to have been a German youth Nicholas, who led 20,000 German children up the Rhine Valley toward the Mediterranean, which, they had been told, would roll back as did the Red Sea for the Children of Israel, and thus provide a passage to the Holy Land. But the miracle did not happen, and the children scattered. Many died because of the hardships of the long journey, some returned to their native towns, and others were adopted by Geneva families [see CRUSADES (The Children's Crusade)].

One may still visit, in the old town of Hamelin, the "Ratcatcher's House," the Ratcatcher's fountain and statue, the gate in the old city wall through which the rats, and later the children, were declared to have been lured; and may follow their pathway even to the mountain where they are supposed to have disappeared. Also, the cathedral of the town

treasures a stone from the ancient walls, where the legend is confirmed in a Latin inscription.

Browning wrote the poem in 1842 for the child of an actor friend, without a thought at the time that it would become famous.

PIEPLANT, the name by which rhubarb is very frequently called. See RHUBARB.

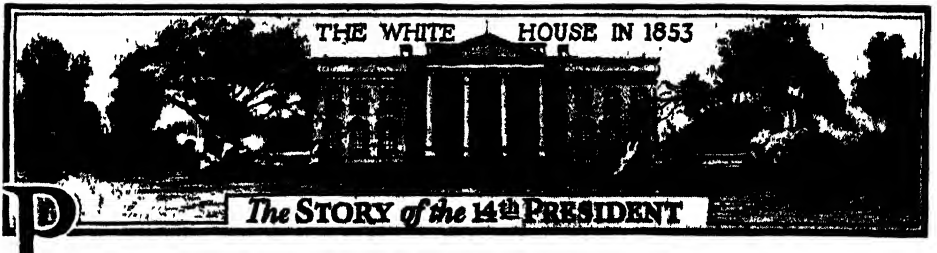
PIEPOWDER, COURT OF, a tribunal in medieval England for the trial of local disputes among peddlers and petty tradesmen.

PIER, a pillar or post supporting a heavy weight, such as the end of a span of a bridge, or the end of an arch. The term is at present most generally applied to the heavy masonry supports of a bridge. It may also mean a construction of covered piles extending from land out into the waters of a bay or harbor, for the purpose of forming a breakwater or a landing place for boats. A bit of thickened wall between two large openings becomes a pier because of the support it gives. In buildings, the pier has developed into the column, with base, shaft, and capital. See COLUMN; BRIDGE; ARCHITECTURE.



FOUR PIERS

(*a*) The foundations of great bridges; (*b*) pier in cloister of Sainte Elne, near Perpignan, France; (*c*) pier in the interior of Saint Peter's, Rome; (*d*) a rude pier, used as a boat landing (see, also, page 1985).



PIERCE, *The* STORY *of the* 14TH PRESIDENT

PIERCE, *peerce*, FRANKLIN (1804-1869), an American statesman, fourteenth President of the United States. Frank Pierce, as his friends always called him, was a genial man, of character and ability. In political matters he cannot be called great. There were many among his contemporaries who must be ranked higher than he—men like Douglas, Cass, and even Marcy. Yet, if he was not a farsighted statesman, he was at least energetic and capable, and he had the gift of selecting able men as his aids. Like most Presidents who have been chosen as the result of compromises, Pierce was himself a compromiser. He wanted to preserve the Union, and to accomplish that purpose he thought it necessary to placate the South. He was a Northerner, with Southern opinions.

In dealing with foreign nations, and particularly with England, he was less willing to compromise; indeed, his Presidency is noteworthy for its vigorous diplomatic history, and for its sure, sometimes overassertive, insistence on American rights. Some of the responsibility for this foreign policy belongs to William L. Marcy, Pierce's Secretary of State, but there is no question that much belongs to the President. Pierce made grave mistakes during his four years in office, but they were mistakes which sprang from a kindly, sympathetic nature. Altogether, though not a great statesman, Pierce was personally one of the most attractive men who have ever guided the destinies of the United States.

Franklin Pierce was born at Hillsborough, N. H., on November 23, 1804. His father, General Benjamin Pierce, won his military title in the Revolutionary War, and later served two terms as governor of New Hampshire. As a boy and young man, Franklin had all the advantages which come to the son of a distinguished parent. At Bowdoin College, which he entered in 1820, he became intimate with Nathaniel Hawthorne, and in his circle of friends were the poet Longfellow and John P. Hale. Many years later, Hale was Pierce's colleague as United States Senator from New Hampshire, and in 1852 was a rival candidate for the Presidency. After graduating from college in 1824, Pierce began the study of law in the office of Levi Woodbury (1789-1851), who was at that time governor of New Hampshire, and was later United States Senator, a member of Jackson's and Van Buren's Cabinets, and

finally Associate Justice of the United States Supreme Court.

His Political Career. Pierce was admitted to the bar in 1827, but two years later abandoned the law for public life. This was a natural step for an ambitious young man who had been since boyhood in continuous association with



Photo: U & U

FRANKLIN PIERCE

The third of five Presidents of the United States who were born in New England. The Adamses, father and son, were sturdy New England types; Arthur, the fourth, born in Vermont, is rated as a son of New York, for most of his life was spent there; Coolidge was born in Vermont, also.

public men. His first office was that of representative in the state legislature. He was reelected three times, and during two terms served as speaker of the house, an unusual honor for a man under thirty years of age.

Pierce was just twenty-eight years old when the Democrats nominated and elected him to the United States House of Representatives. There he served until his election to the Senate in 1837. When he took his seat, he had the distinction of being the youngest member of that body. He became a vigorous supporter of the policies laid down by President Jackson and followed by President Van Buren. He opposed the renewal of the charter for the Bank of the United States, voted against appropriations for the Military Academy at West Point, and on every occasion fought appropriations for internal improvements. It is interesting to note, however, that he did not approve the spoils system, which was advocated both by Jackson and by Van Buren. In Congress at this time were the political giants, Benton, Webster, Clay, and Calhoun, who somewhat overshadowed Pierce, but the latter was nevertheless missed after 1842, when he resigned from the Senate and resumed the practice of law.

During the next five years Pierce had one opportunity after another to reënter political life, but again and again he stated his intention never again to hold public office. The governor of New Hampshire offered him an appointment to the Senate to fill a vacancy; the Democrats of the state urged him to accept the nomination for governor, and President Polk tendered him the Attorney-Generalship of the United States. But Pierce declined each offer in turn. He did not, however, cease to take an interest in politics, and was consulted by Democratic leaders on questions of party policy. He even took the stump against John P. Hale, his friend and college mate, in the famous campaign known as "the Hale storm of 1845."

Hale was a Democratic Representative from New Hampshire who had won prominence by his opposition to "gag rule." He was renominated by the state convention in 1844, but when the state legislature resolved that the New Hampshire members of Congress should vote for the annexation of Texas, he issued a statement opposing annexation on antislavery grounds. The convention was hastily reassembled, Hale was declared a traitor to his party, and his name was taken off the ticket. He then ran as an independent, but neither he nor the Whig candidate received a majority of the votes cast. Then Hale carried on a whirlwind campaign to win New Hampshire to the antislavery cause, and in the face of a powerful Democratic majority, headed by Pierce, succeeded in obtaining a legislature in which the Whigs and antislavery Democrats had a majority. In this contest Pierce clearly revealed the fact that he was "a Northern statesman with Southern principles."

At the outbreak of the Mexican War, Pierce volunteered as a private soldier. Before long, however, President Polk commissioned him a colonel, and in March, 1847, appointed him brigadier general of volunteers. Pierce promptly sailed for Vera Cruz, where he joined General Winfield Scott in time to take part in the battles of Contreras and Churubusco. At Contreras Pierce was thrown from his horse, but, although suffering great pain, refused to leave the field. This brief military experience, although creditable, added little to his reputation. He was never associated in the public mind with military affairs.

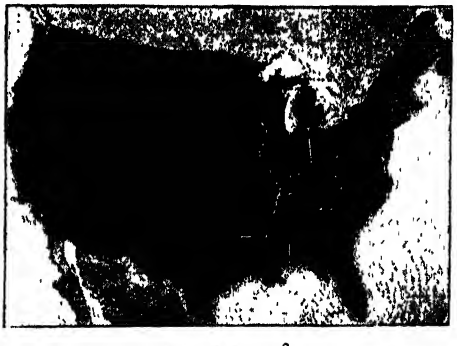
Presidential Candidate. During the four years following the Mexican War, Pierce practiced law at Concord, N. H. Except for a single instance, in 1850, when he was president of a convention to draft a new constitution for New Hampshire, he had no part in public affairs. This aloofness from the issues of the day made him an acceptable compromise candidate for the Presidency in 1852. The Democratic convention met at Baltimore on June 1. To the previous party declarations on the subject of slavery, its platform added a new resolution, pledging the party to a faithful execution of the Compromise of 1850, "the act for reclaiming fugitive slaves included," and to a resistance of all attempts to renew agitation of the slavery question. Then the convention struggled fruitlessly for three days to nominate; Cass, Marcy, Buchanan, and Douglas were formidable candidates. On the thirty-fifth ballot General Pierce received a few votes, and on the forty-ninth ballot he was nominated. It cannot be said that Pierce was a national leader, but he held a respectable place in public life, was personally attractive, and was popular; he had no record to attack and no enemies to fear. Less able than any of the men he defeated, events proved that he was a safe selection under the existing conditions.

To oppose him the Whigs nominated General Winfield Scott, on a platform almost identical with that of the Democrats, recognizing the "finality" of the Compromise of 1850. Some of the Southern Whigs refused to support Scott because of his lukewarm attitude toward the Compromise. The Free-Soilers thereupon held a convention of their own, and nominated for President John P. Hale, Pierce's old college friend and political opponent. Between Pierce and Scott there was no real issue except the personality of the candidates, and the campaign soon degenerated into petty personalities. Scott was called a "miracle of vanity," and Pierce was unjustly abused as a coward in the Mexican War and a drunkard in private life. There was no enthusiasm for Scott, and the result was foreseen for weeks. Pierce carried every state except Massachusetts, Vermont, Kentucky, and Tennessee, and received 254 electoral votes to 42 for Scott.

The Administration of Franklin Pierce, 1853-1857

Pierce was inaugurated "in the full sunshine of popularity," and delivered an optimistic inaugural address before the largest assembly which had ever gathered in Washington on such an occasion. In selecting his Cabinet, Pierce showed the same optimism and, as a means of maintaining compromise, chose men of all factions. William L. Marcy, Secretary of State, was a leader of the New York state "Hunkers," or conservative Democrats. James Guthrie, Secretary of the Treasury, and James C. Dobbin, Secretary of the Navy, were conservative Southern Democrats. But on the radical side were Robert McClelland, Secretary of the Interior, an antislavery Northerner; Jefferson Davis, Secretary of War, a states'-rights Southerner; and Caleb Cushing, Attorney-General, originally a Massachusetts Whig. Although composed of so many elements, this Cabinet remained unchanged throughout the whole of Pierce's administration, a unique distinction in the history of the United States.

The Kansas-Nebraska Bill. In spite of the fact that the platforms both of the Whigs and of the Democrats accepted the finality of the Compromise of 1850, the slavery question came to the front in less than a year after Pierce's inauguration. In January, 1854, Stephen A. Douglas introduced into the Senate the Kansas-Nebraska Bill. It passed at once, and became a law on May 30. Thus Congress repealed the Missouri Compromise of 1820, and left the new territories free to decide for themselves whether they would or would not admit slavery. Kansas, the territory nearest the newer states, was turned into a battle ground, into which proslavery and antislavery men were poured by hundreds. The history of Kansas during this period is a record of civil war. Organized mobs took possession of polling places and carried elections. Lawrence and Osawatomie, the two chief antislavery



ELECTION MAP, 1852

The states shown in black chose Democratic (Pierce) electors, those cross-shaded were Whig, and voted for Scott The remaining area was unorganized territory.

settlements, were raided and sacked, and legislatures were dispersed by force. There were, in fact, two rival state governments, one proslavery, the other antislavery.

Few acts more fateful in character than the Kansas-Nebraska Bill ever passed the Congress of the United States, for it set in motion the train of circumstances which led inevitably to the War of Secession. It was the direct cause

of a radical change in political sentiment in the North. It brought about the complete failure of the compromising policy of which Pierce himself was in favor, and, lastly, it destroyed the old national political parties. For this sudden, reckless disturbance, Pierce has been severely criticized. In his first annual message to Congress, he congratulated the country on its calm, adding, "That this repose is to suffer no shock during my official term if I have the power to avert it, those who placed me here may be assured." A farsighted statesman should have foreseen the dangers which the repeal of the Missouri Compromise would involve. But Pierce was not farsighted, and he was not a great statesman; he was a man of fair abilities and excellent intentions, but was dominated by the leaders of his party.

Assault on Sumner. On February 11, 1856, President Pierce issued a proclamation calling for a halt to the violence and disorder existing in Kansas, and appealed to Kansans to obey the laws. This proclamation was followed in May by a raid on Lawrence. Almost at the same time there occurred in Congress an episode which stirred the nation to new depths. On May 19 Senator Sumner of Massachusetts delivered a fiery speech, which he called "The Crime Against Kansas." As one historian says, Sumner freed his mind in a speech "as offensive and insulting to the South as the fertile imagination of the author could possibly make it." In the course of the speech, Sumner made several sneering allusions to Southern leaders, especially Senator Butler of South Carolina. Two days later, Butler's nephew, Representative Preston S. Brooks, attacked Sumner seated at his desk, and beat him to insensibility with a cane. The North was impressed by the attack on a man under such a disadvantage, but it ignored the provocation; the South saw that an Abolitionist had been soundly thrashed, and it ignored the circumstances.

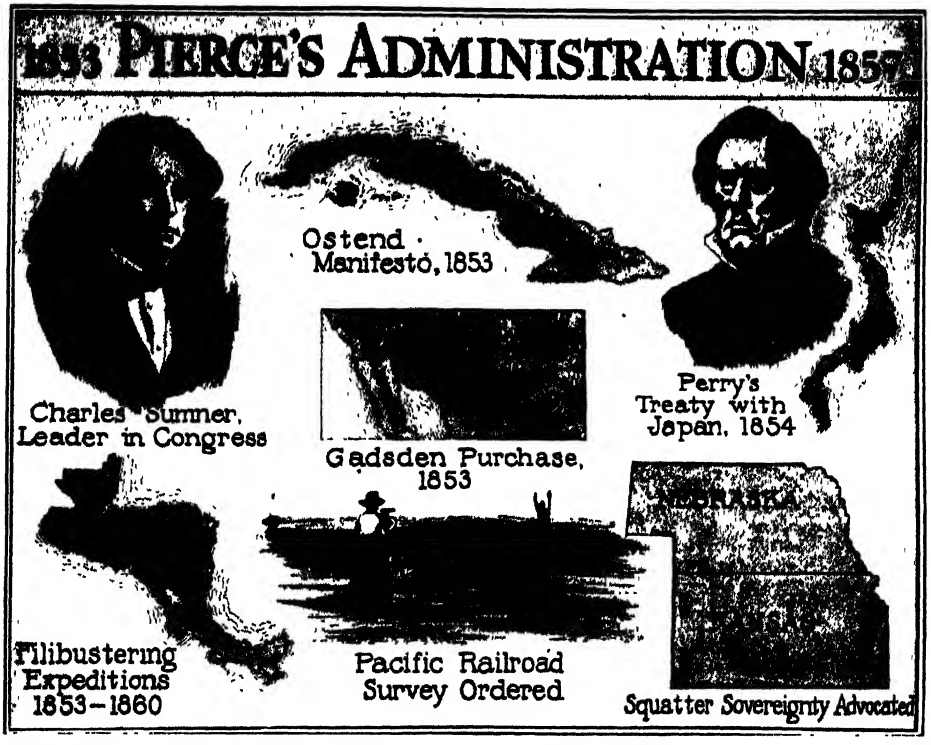
Birth of the Republican Party. Far more important than such violent spasms of partisan feeling was the birth of a new political party, the new, long-dreaded sectional party. The circumstances of its organization are given in detail elsewhere (see REPUBLICAN PARTY), and it is only necessary here to point to the fact that the Kansas-Nebraska Bill was directly responsible for its existence.

Foreign Relations. During Pierce's administration, the foreign relations of the United States were characterized by the same sense of national importance which brought about the annexation of Texas. It was an age of a crude belief in the universal superiority of Americans and American institutions, and an equally strong contempt for the monarchical institutions of Europe. An amusing side to this contempt was shown by a circular issued shortly after Marcy became Secretary of State. It advised American diplomatic representatives at foreign courts not to wear ceremonial court uniforms, but to appear "like Franklin, in the simple costume of an American citizen." Thus Buchanan, then minister at London, had some difficulties with the Master of Ceremonies, but was finally allowed to attend "in the ordinary dress of an American citizen." But his biographer adds that to this dress, "in order to distinguish himself from the court servants, he thoughtfully added a small sword."

In its more serious diplomatic dealings, a similar spirit was evident. In 1853 Martin Koszta, an Hungarian political refugee, returned to Europe before taking out his final naturalization papers. He was seized by the commander of an Austrian warship in a Turkish port, but Captain Ingraham of the U. S. S. *Saint Louis* forced the Austrians to release Koszta, and the United States government gave Ingraham its approval. A most important matter was Perry's expedition to Japan, which resulted in opening Japanese ports to American commerce and introducing western civilization into that country. Nearer home was Hawaii, which Marcy attempted to annex in 1854; the plan failed only because the Hawaiian king died before arrangements were completed. The boundary question with Mexico was settled by the Gadsden Purchase of 1853. In similar fashion the long-standing dispute with Canada over the Atlantic fisheries was settled by treaty in 1854. Marcy, negotiating with the Earl of Elgin, obtained equal fishing rights for American fishermen in exchange for certain concessions which were included in a commercial reciprocity treaty.

The Ostend Manifesto. The most serious problems in foreign relations concerned expansion southward, first to Cuba, and secondly to the Isthmus of Panama. The leaders of the South were eager to annex Cuba, and without question expected vigorous action from Pierce. Marcy, however, was cautious, although not opposed to annexation, and in 1854, after Pierre Soule, the American minister at Madrid, had nearly embroiled the United States in a war with Spain, instructed him to meet Buchanan, minister to England, and John Y. Mason, minister to France, to confer on a policy to be followed by the United States toward Cuba. The result of this conference was the famous Ostend Manifesto.

Central American Problems. With Great Britain the United States argued certain questions involving a shadowy British protectorate over a large section of Central America. This Mosquito protectorate, Marcy instructed Buchanan, must be renounced, but the matter was finally allowed to dwindle to diplomatic sparring. Marcy was more vigorous, however, in treating another problem at home in 1856, when the British minister at Washington seemed to



lend his support to an attempt to secure recruits for the British army to serve in the Crimean War. Marcy thereupon refused to hold any further diplomatic intercourse with Crampton, the British minister—a step which might easily have led to war. Also, in 1856, the United States forced Denmark to abandon the collection of its ancient "Sound dues," a toll which it had taken from foreign nations for centuries. In Nicaragua the United States gave official recognition to the government headed by William Walker, the filibuster. The general sentiment of the nation toward these complicated problems is clearly expressed by Nathaniel Hawthorne, who was then American consul at Liverpool, in a letter to a friend at Boston. He said:

> Our relations with England seem to me to bear a more pacific aspect than for many months past. Frank Pierce never did a better thing than in recognizing Walker's government; it has brought John Bull to his bearings, and with his customary growling and grumbling, he is going to back out. Crampton ought to have been dismissed more promptly; but it is better late than never.

Two weeks later, Hawthorne wrote again:

> We have gained a great triumph over England, and I begin to like her better now. . We have gone through a crisis and come out right side up. Give Frank Pierce credit for this, at least; it was his spirit that did it.

Domestic Prosperity. If slavery was the chief question, and during the last two years of Pierce's administration practically the sole question, in the public mind, there were, nevertheless, many other problems and events of interest. There were, for example, matters primarily of local interest, such as a terrible epidemic of yellow fever at New Orleans, which continued for a decade. There was the labor-saving exhibit in the Crystal Palace, at New York, which is usually called the first "world's fair."

More important by far was the remarkable westward expansion of American railroads, which reached a climax about 1856 and 1857. Between 1849 and 1857, seven trunk lines were constructed across the Appalachian Mountains, and most of these, by their connections in the central states, could reach the Ohio River and the Mississippi River, and ambitious plans were projected to connect the Atlantic and Pacific by railroads. Survey parties were sent out by Secretary of War Davis to find the shortest and best route for a transcontinental railroad with a terminus on the Pacific coast.

The rush of railway building was accompanied by a steadily increasing demand for government assistance. The first public grant, in 1850, was made to the Illinois Central Railway, and included 2,500,000 acres. "The

OUTLINE AND QUESTIONS ON FRANKLIN PIERCE

Outline

I. Early Life

(1) Birth and parentage
(2) Education
  (a) Associates at Bowdoin
(3) Law study

II. Political Career

(1) In New Hampshire legislature
  (a) Speaker of the house
(2) In national House of Representatives
(3) In the Senate
  (a) Youngest member
  (b) Stand on public questions

III. In Private Life

(1) Return to law practice
(2) The "Hale storm of 1845"
(3) In Mexican War
(4) "Compromise candidate" for Presidency in 1852
(5) Comparison with other candidates for nomination
(6) The election
  (a) Issues
  (b) Candidates
  (c) Result

IV. Administration

(1) Governmental affairs
  (a) Inaugural address
  (b) Selection of compromise Cabinet
  (c) The Kansas-Nebraska Bill
    1. Doctrine of popular sovereignty
    2. Effects in Kansas
    3 Overthrow of Pierce's compromise policy
  (d) The attack on Sumner
  (e) Birth of the Republican party
(2) Foreign relations
  (a) The Martin Koszta affair
  (b) Perry's expedition to Japan
    1 Opening of treaty ports
  (c) Attempt at Hawaiian annexation
  (d) Gadsden Purchase
  (e) Canada fisheries question
  (f) Ostend Manifesto
  (g) Central American problems
(3) Internal affairs of interest
  (a) Yellow fever epidemic at New Orleans
  (b) First "world's fair"
  (c) Railroad expansion westward
    1. Changes in agricultural conditions

Questions

How would you account for Pierce's nomination to the Presidency when there were many men in the field more able than he?

How did it happen that a distinguished American diplomat appeared at British court functions in his ordinary clothes and a small sword?

What act of Congress was directly responsible for the creation of a great political party which is in existence to-day?

Mention three friends of Pierce's during his college days, and tell for what each became famous.

What unusual honor did he receive when he was less than thirty?

What was the "Hale storm of 1845," and how did it prove Pierce a man of Southern sympathies?

What proportion of the electoral votes did he receive in 1852?

What distinction was attached to Pierce's Cabinet?

What former act of Congress was practically repealed by the Kansas-Nebraska Bill? What was the effect of this latter act in Kansas?

How did a United States Senator suffer during this administration for a rash speech he had made?

Who was William Walker? What attitude did the United States take toward his schemes, and what was the result?

When and where was the first "world's fair" held, and what was exhibited there?

What steps in the development of the railroad system were taken during Pierce's administration?

How did the foreign policy of this administration differ broadly from its domestic policy?

What was the prime object of the Tariff Act of 1856?

West," said one rhapsodic Ohioan, "is no longer the West, nor even the Great West; it is the Great Center."

The significance of railroad expansion was most clearly marked by changes in agricultural conditions. The grain of the interior found a larger market in the East and in Europe. The center of the grazing industry passed from the northeastern states to the newer states north of the Ohio and to Texas. In the South the railways helped to a lesser degree in extending the cultivation of cotton and increasing the prosperity of the cotton planters. The prosperity of the agricultural West and South was followed by a new industrial prosperity, by a great impetus to manufactures, in the East. The United States government, too, was so prosperous and had accumulated such a large gold reserve that Congress in the closing months of Pierce's administration passed the tariff of 1856, whose primary object was to reduce duties so that the revenue of the government might decline. At the end of Pierce's term the United States was prosperous and looked to a magnificent industrial, agricultural, and financial future. However, he failed of renomination, though at the beginning of the Democratic National Convention of 1856, he showed particular strength.

After the expiration of his term, Pierce traveled in Europe for several years, and took no further part in politics. He died on October 8, 1869, and was buried at Concord, N. H., where a monument was erected to him in 1914. E.D.F.

Jane Means Appleton Pierce (1806-1863), born at Hampton, New Hampshire, the daughter of Dr Jesse Appleton, president of Bowdoin College She grew up in surroundings of culture and learning; in 1834 she married Franklin Pierce, a Representative in Congress They later established a home in Concord, and in 1842 Pierce retired from the Senate and returned there to build up his private law practice Mrs Pierce's ill health caused him to decline appointment as Attorney-General under Polk During these years, two of their three sons died in early youth The third remained with Mrs. Pierce in Concord while her husband was engaged in the war with Mexico



Photo U & U

JANE APPLETON PIERCE

Mrs. Pierce's already feeble health was further impaired by the tragic death of her son, which occurred in a railroad accident two months before Pierce was inaugurated. Nevertheless, she assumed all of her duties at the White House, attended receptions, and presided at state and private dinners She consistently shrank, however, from any public attention.

In 1857-1858, Mr. and Mrs. Pierce spent two years traveling, first in the island of Madeira and then in continental Europe Mrs. Pierce's health did not improve, however, and she died at Andover, Massachusetts, in 1863

Related Subjects. The reader who desires additional information respecting events in the life and times of this President is referred in these volumes to the following articles

Compromise of 1850	Ostend Manifesto
Kansas (History)	Perry, Matthew C.
Kansas-Nebraska Bill	Political Parties
Mexican War	Sumner, Charles

PIERIDAE, *pi ur' ih de.* See BUTTERFLY (Classification).

PIERPONT, FRANCIS HARRISON (1814-1899), an American political leader, honored by West Virginia as one of its representatives in Statuary Hall, Washington, D. C. He was born in Monongalia County, Va. (now West Virginia). After his graduation from Allegheny College (Pennsylvania), he studied law, and about 1845 began practice at Fairmont, Va. After Virginia seceded from the Union, representatives from forty western counties organized the "Restored Government of Virginia" and elected him governor. Pierpont was known as one of the war governors, having assisted in the mobilization and dispatch to the front of more than 40,000 Union troops during the War of Secession. When West Virginia was admitted to the Union as a separate state, in 1863, he moved his capital to Alexandria under the protection of the Federal army. After the evacuation of Richmond, Pierpont made that city his headquarters, and acted as governor for the entire state until 1868. See STATUARY HALL.

PIERRE, *peer,* S. D. See SOUTH DAKOTA (back of map).

PIGEON, *pij' un.* The soft, guttural cooing of a pigeon in its roosting place on a roof, and the metallic luster of its feathers, as it struts and feeds on the ground, are familiar to dwellers in city and country, for these hardy birds seem to enjoy the smoke and noise of a metropolis as much as the quiet of the fields. Probably the most famous pigeons in the world are those which flutter down to be fed every day in Saint Mark's Square, in Venice. Every part of the world where pigeons can obtain food knows them, for there are more than 650 widely scattered species.

Pigeons vary greatly in appearance and habits, but in general they are medium-sized birds with dense, smooth feathers. In temperate regions this plumage is gray, brown, grayish-blue, or slate, frequently with a beautiful luster. In the tropics and the Orient, the so-called "fruit pigeons" (comprising half of the species) have plumage of brilliant green, orange, and other vivid colors.

Some pigeons live in trees and others build their nests on the ground; some live in colonies

and others in isolated pairs. The pigeon does not raise its head, as do other birds, in swallowing; it is gluttonous in its eating habits, and has a very large crop, in which it is able to store food and carry it to its young. It is frequently defenseless before its enemies, building its rude nest in exposed places where it is in constant danger. The pairs mate for life. The eggs are usually white in color, two in number, and are cared for during hatching by the male and the female in turn. Pigeons feed their young at first with a milky fluid, called *pigeon's milk*, secreted in the crop and fed through the bill into the gaping mouth of the nestlings. The food of pigeons consists of fruit, grain, seeds, etc.; unlike poultry, they need a certain amount of salt in their diet.

The wild *passenger pigeon* of North America is now extinct; all domestic forms, as well as "fancy" breeds, are thought to be descendants of the wild *rock pigeon* found in Europe. Common pigeons differ from the wild stock, but specially improved breeds are the *carrier pigeons* and the *homing pigeons*, the first used for messenger service and the second for the sport of pigeon-racing, for exhibition, and for food. The latter use for pigeons is extensive, and many large flocks of various kinds of pigeons are maintained near large cities to meet the demand for squabs, or young pigeons, which are considered a great delicacy.



THE PIGEON

'Tis a bird I love, with its brooding note,
And the trembling throb in its mottled throat,
There's a human look in its swelling breast,
And the gentle curve of its lowly crest.
—WILLIS *The Belfry Pigeon.*

Only a few of the "fancy" varieties may be mentioned here. Favorites among exhibition birds are the *tumblers*, which not only fly but turn somersaults in the air; the *fantail pigeon*, with large tail and head thrown back for balance; the *pouter pigeon*, with its large inflated crop; the *Jacobin*, with its neck feathers turning upward to form a cowl about its head.

Many of the smaller species are called *doves*. The most famous is the *turtledove*, found in the eastern hemisphere and mentioned in the beautiful lines from the *Song of Solomon*:

For, lo, the winter is past,
The rain is over and gone;
The flowers appear on the earth;
The time of the singing of birds is come,
And the voice of the turtle is heard in our land.



Photo: Wide World

HOMING PIGEON

The United States Army uses homing pigeons in the Panama Canal Zone. To protect the birds from hawks, whistles weighing one-quarter ounce are fastened to their tails. As the pigeons fly, the rush of air causes the whistles to sound, and the astonished hawks fear to attack. The homing pigeon can stay in the air from morning until night, and it flies at a high rate of speed; the record among pigeon societies is more than a mile and a quarter in one minute. In the World War these pigeons rendered invaluable service; even when wounded, if still able to fly, they "carried on" through gunfire and the terrors of battle.



POUTER PIGEON

The name turtledove is sometimes applied to a different bird in North America, the so-called

mourning dove, whose plaintive mating call, a long-drawn-out "coo-o-o," is a familiar sound of early summer.

Pigeons have been domesticated from the earliest times. They were regarded by primitive peoples with much affection, and one of the indications of wealth was the number of dovecotes a man possessed. The Bible mention of turtledoves and pigeons is usually in connection with sacrifice. As in the case of the parents of Jesus (*Luke* II, 24), the poor were allowed to bring, instead of a lamb, "a pair of turtledoves, or two young pigeons." Pliny wrote of pigeons, especially noting their manner in drinking—"not holding up their bills between whiles."

Classification. Pigeons belong to the order *Columbae* and the family *Columbidae*. The rock pigeon is *Columba livia*.

Related Subjects. The reader is referred in these volumes to the following articles

Carrier Pigeon	Passenger Pigeon
Dodo	Turtledove
Dove	

PIGEON BERRY. See POKEWEED.

PIGEON RIVER. See MINNESOTA (Location).

PIGFISH. See GRUNT.

PIG IRON. See IRON AND STEEL.

PIGMENT. See COLOR; PAINT.

PIGWEED, a common weed of the amaranth family (see AMARANTH), the strong, hardy root of which thrives in any soil capable of cultivation. This persistent weed sometimes grows two or three feet high, and produces large coarse leaves and small greenish flowers. The latter are borne on a densely crowded spike. The leaves are sometimes covered with stiff hairs. Pigweed is best eradicated by thorough cultivation of the soil and complete uprooting of the plant. It was given its name because hogs are supposed to relish it. B.M.D.

Scientific Name. The scientific name of the plant is *Amarantus retroflexus*. The name pigweed is also applied to the goosefoot (which see).

PIKA, *pi' kah*, any one of several species of rodents found on the heights of mountains in Asia, Europe, and Western North America. Pikas are near relatives of the hare and the rabbit, but look much more like the guinea pig. The American species, found just above the timber line, is a little creature about seven inches long, with a tail less than an inch in length. It has a rough, blackish coat, which is dirty white beneath. The call of these animals resembles a whistle, and not infrequently one can hear them calling back and forth to one another.

Pikas are inclined to be sociable, and several are often found living together in a heap of rock fragments at the foot of a cliff. They are quite harmless, and feed on plants, industriously collecting hay and dried vegetables to use in the winter as food and bedding. Other names given them are *conies*, *little chief hares*, and *calling hares*. W.N.H.

Scientific Name. Pikas belong to the family *Ochotonidae*. The American species is *Ochotona princeps*.



THE PIKA

About one-fourth actual size.

PIKE, the common name of a family of fresh-water fish noted for their voracious appetites and fighting qualities. Of the seven species, all but the *common pike* (also called *Great Lakes pike* and *pickerel*) are found only in North America. The names *pike* and *pickerel* are often confused. There are three species of pike which properly have the latter name, the *banded*, *little*, and *common eastern* pickerels (see PICKEREL). There are also three forms of muskellunge (which see) belonging to the pike family, one of which is called *great northern pike*. The so-called *pike perch* is a perch, and the *gar pike* is a garfish.

The common pike is the most important species of the family, and the one of widest distribution, being found in northern fresh waters of North America, Europe, and Asia.



Pikes, the tyrants of the wat'ry plains —POPE.

It occurs in large numbers in the Great Lakes and in smaller lakes in Canada and the upper Mississippi Valley. It may attain a length of four feet and a weight of forty pounds; in color it is bluish or greenish-gray, with irregular rows of whitish or yellowish spots. Besides being larger than pickerel, the pike has scales part way down the sides of the head, while pickerel are completely scaled. Like its relatives, the pike is a terror to other fish in the waters it inhabits, greedily devouring about one-fifth of its own weight daily. It is a fine game fish, and its flesh is good eating. L.H.

Scientific Name. The common pike described above is *Esox lucius*.

PIKE, ZEBULON MONTGOMERY (1779-1813), an American soldier and explorer, for whom one of the best-known mountain peaks in the United States was named. He was the son of an army officer, and was born at Lamberton, N. J. When but fifteen years of age, he entered his father's regiment as a cadet, and five years later was made first lieutenant. The first of the exploring expeditions for which he became famous was begun in August, 1805; it had as its object the discovery of the headwaters of the Mississippi River. After penetrating to Cass Lake (Upper Red Cedar), he turned back to Saint Louis, and in July, 1806, set out to explore another portion of the Louisiana Purchase territory. He passed along the Missouri and Osage rivers into what is now Kansas, and perhaps north into Nebraska; then, turning south, he marched to the Arkansas River. Following this stream through the Royal Gorge to the present site of Pueblo, Colo., he sighted on November 23 the peak which later was named for him. In his search for the Red River, Pike entered Spanish territory, unaware of his trespass, and was there detained for a time.



ZEBULON PIKE

He was promoted through various ranks to that of colonel (1812), and took an active part in the early stages of the War of 1812. In the attack on York, Canada, he was killed by a fragment of rock shattered by the explosion of a powder magazine set afire by a retreating British garrison. See MINNEAPOLIS, MINN.; PIKE'S PEAK.

In Literature. Pike published a three-volume work dealing with his explorations, *Expedition of Zebulon M. Pike to the Headwaters of the Mississippi, Through Louisiana Territory, and in New Spain.* It was not well written, but was an authentic report of a new land and was translated into European languages.

Related Subjects. See PIKE'S PEAK; for other exploring expeditions in the West, see LEWIS AND CLARK EXPEDITION; FREMONT, JOHN C.

PIKE DORY. See PERCH.

PIKE'S PEAK, the best known, though not the highest, of the Rocky Mountain peaks in Colorado. A summit of the Rampart range, it lifts its snow-capped peak 14,108 feet above sea level, and is covered with pine forests to a height of 11,700 feet. It was discovered in November, 1806, by Lieutenant Zebulon Montgomery Pike, who climbed part way up but lost his way and had to turn back. He declared the peak could not be reached, but the ascent was made by members of Major Long's exploring expedition in 1819. At the present time the ascent can be made either on horseback, on the cog-railway, nine miles long, or by a thirty-mile automobile highway which begins at Colorado Springs, six miles east. The famous cog-railway was constructed at a cost of nearly $1,000,000, and a half of its distance is taken up by curves. A huge searchlight was placed at the top in 1905. The Weather Bureau maintains one of the highest meteorological stations in the world at the summit of this peak.



PIKE'S PEAK RAILWAY

Denver is sixty-five miles north of the peak. On a clear day the view from its summit over the great plains and mountains, with their beautiful lakes and rivers, is enchanting. See PIKE, ZEBULON MONTGOMERY.

PILASTER, *pi las' ter*, a square pillar projecting from a wall or pier from one-fourth to one-third its width, and finished with a base and

capital like a column. The pilaster originated in Greek architecture and was adopted by the Romans, who sometimes utilized it for their amphitheaters, notably in the top story of the Colosseum. Pilasters are used for ornament and also for supporting an arch or a cornice. The finest are found in the Italian Renaissance style of architecture. See ARCHITECTURE (The Renaissance and After).



PILASTERS

The letter *a* locates pilasters. The building shown is a corner of the old City Hall, New York City

PILATE, *pi'-layt,* PONTIUS, the Roman governor of Judea, Samaria, and a part of Idumea at the time of the Crucifixion of Christ, serving from A.D. 26 to 36. Officially, he was known as *procurator.* He lived at Caesarea, and during the national feasts he went to Jerusalem, usually to keep order. He enjoyed complete control over his territory, and except in the cases of Roman citizens, he had full judicial authority. Pilate was a narrow-minded man, unfitted to be a ruler over Jews and Gentiles alike, for he was never able to understand the national pride and the intensity of religious feelings of the Jews. When the Jews demanded Christ's death, he insisted on a trial, and in spite of the charges of false teachings and claims of kingship, Pilate failed to find Jesus politically harmful, and would have released him had he not feared to lose his office. An account of this trial is given in *Matthew* XXVII.

Of the last years of Pilate's life it is only known that he was called to Rome to defend himself against charges of cruelty. Some have alleged that he died in Gaul by suicide; others claimed that his body was thrown first into the Tiber River, and then into the Rhone, neither of which would receive him, until finally the body was plunged into a lake near Lucerne, Switzerland, at the foot of a mountain which later was named Mount Pilatus from the legend. According to this last tradition, which is the most fantastic of all, his ghost still haunts the region. The Abyssinian Church has canonized him. See JESUS CHRIST.

PILCHARD. See SARDINE.

PILCHER, PERCY. See AIRCRAFT (Heavier than Air).

PILCOMAYO, *peel ko mah' yo,* **RIVER.** See BOLIVIA (The Land and Its Rivers); PARAGUAY RIVER.

PILE, a long, thick pole sharpened at one end, driven into soft ground to support buildings, or used in the construction of bridges, piers, and wharves. Tree trunks of considerable length but of slight girth are most commonly used. The top of the log is protected by an iron band so as to keep the log from shattering under heavy blows, and the bottom is often shod with cast iron to enable it to penetrate compact soil. A battering ram, commonly known as a pile-driver and usually driven by steam power, is used for forcing the pile downward into position. Cofferdams are temporary enclosures in water which consist of piles driven close together and packed with clay or concrete. See COFFERDAM; ARCHITECTURE.

PILES, also known as HEMORRHOIDS, *hem' o roidz,* are enlargements of blood vessels at or near the opening of the rectum. They are usually, though not always, the result of constipation, particularly when that condition is accompanied by straining at stool. Some mild cases give no discomfort, but inflamed hemorrhoids are very painful, especially when they protrude from the rectum. Itching and bleeding may or may not be present. If the condition becomes greatly aggravated, a surgical operation may be necessary. Ordinary cases yield to local treatment. The use of medicated capsules, or suppositories, inserted into the rectum, will sometimes cure painful hemorrhoids. Another effective remedy is the application of a pad deeply covered with vaseline. W.A.E.

[For the control of constipation, see the article LIFE EXTENSION, Section 10.]

PILGRIMS. In the early days of Plymouth Colony, founded in 1620 in Massachusetts, Governor William Bradford often referred to his people as "pilgrims and strangers upon the earth." From this expression has come the use of the name "Pilgrims" for that heroic band of liberty-seekers who made new homes for themselves on a new continent, over three centuries ago. The Pilgrims are not identical with the Puritans, though the two groups are often confused. The former were members of a sect that grew out of Puritanism, and in England were called *Separatists,* because they separated from the Church of England. The first church of Separatists was at Gainsborough, England; a second and more powerful one grew up at Scrooby. Driven out of England by persecution, the Separatists established themselves first at Amsterdam, then at Leyden, in Holland, and finally in America, where they became known as Pilgrims. See page 5616.

Related Subjects. The reader is referred in these volumes to the following articles:

Massachusetts (History: First Century)	Plymouth Colony
Mayflower	Plymouth Rock
	Puritans

PILGRIM SHELL. See SHELL.



Photo Visual Education Service

LANDING OF THE PILGRIMS

[Reproduced from the painting by Charles Lucy, finished in 1854] See article PILGRIMS, page 5615.

PILGRIM'S PROGRESS. See NOVEL (The Novel in England); BIBLIOMANIA; BUNYAN, JOHN.

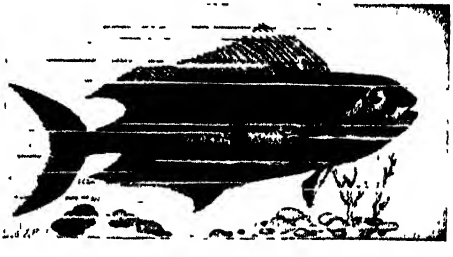
PILLARS OF HERCULES. See HERCULES, PILLARS OF; ATLANTIS.

PILLORY, an old instrument of punishment which consisted of wooden posts and a platform, with a framework so constructed that the head and hands of the culprit, and sometimes his feet, also, could be thrust through holes, exposing him to public view and the scorn and ridicule of the people. The holes for the feet were called *stocks*. In times long past, the pillory was one of the chief sights of every English village, where it was used for all manner of offenses of not too serious a character. Daniel Defoe, author of *Robinson Crusoe*, was pilloried for publishing a book without a license; women were often placed in it; to increase the humiliation, sometimes the heads of both men and women victims were shaved.

From England the pillory was introduced into the New England colonies, and was a favored means of punishment there, particularly in Massachusetts and Rhode Island. It was usually occupied by "notorious drunkards, scolds, bawds," and other undesirable persons. Its use persisted for many years, and was a legal instrument of punishment in Delaware until 1905. Though this was the last state in the Union to abolish the pillory, for over a hundred years no person in Delaware had been pilloried. That term is sometimes used figuratively, as in referring to a person who is held up to scorn and ridicule in the press.

PILOT BREAD. See BREAD (What Bread Is).

PILOT FISH, a species of fish found usually in tropical and the warmer temperate seas, but seen occasionally off the coasts of North



THE PILOT FISH

America and Great Britain. It is long and silver-gray in color, striped with bars of a very dark blue; this coloration is very noticeable even at a distance. The fish has delicate flesh which resembles mackerel in flavor, but it is

not often found in markets, because of its rarity.

The name of this fish is derived from its habit of accompanying ships and sharks; its close companionship with the latter has excited much comment, many observers believing that it guides the shark to its food. It swims close in front of the shark, but probably does this for the purpose of feeding on fragments which the larger fish scatters, and to secure protection from its enemies. It is believed that the pilot fish is never attacked by its giant friend. By the ancients the pilot fish was regarded as sacred, as they thought it directed lost sailors, and by suddenly disappearing announced that land was not far distant. L.H.

Scientific Name. The pilot fish is known as *Naucrates ductor*. It belongs to the family *Crangidae*

PILOT KNOB. See OZARK MOUNTAINS.

PILOT SNAKE. See COPPERHEAD.

PILSEN, *pil' zen* See CZECHOSLOVAKIA (Principal Cities).

PILSUDSKI, *pil soot' ske*, JOSEPH [Polish, JOSEF] (1867-), a Polish dictator and popular military hero. His deep and disinterested love for his country and his determined efforts through many years helped to bring about the independence of Poland and laid the foundations of a strong democratic state.



Photo U & U

JOSEF PILSUDSKI

Pilsudski was born in Lithuania, and educated at the Gymnasium of Vilna and the University of Kharkov, Russia. At the age of twenty, he was exiled to Siberia for a five-year term, though the trial showed him to be innocent of implication in the anti-czarist plot of which he was accused. When he returned, he had learned many things about the Russians, and he joined the newly formed Polish Socialist party organized to free Poland from the oppression of Russia. Idealism of aims, realism of means, was his creed. The romantic aim of a Polish republic he accomplished through the realistic means of propaganda and a devoted army.

The Workman, which he published from 1894 to 1904, voiced the most radical ideas of the day and laid the foundation for his determined policy of armed resistance to Russia. Secret societies were the order of the day, and risking his freedom, if not his life, the young Pilsudski was found at the head of the political activities working for emancipation. He always had the support of the workmen, who often organized themselves in armed forces to protect meetings and demonstrations of their ambitious leader. In 1900 Pilsudski and his wife were arrested and he was imprisoned for a year, escaping a life sentence by pleading insanity, for which he was sent to a hospital in Saint Petersburg (now Leningrad). In a short time the Polish Socialist party rescued him.

Pilsudski saw clearly that armed resistance would be the only means by which Russian rule could be cast off, and to accomplish this purpose, in face of lack of funds and munitions, he decided to seek outside aid. The Russo-Japanese War offered an opportunity, and he set out for Japan, but met with indifference. Failure did not discourage him, and by 1908 the first Rifle Exercise Corps, a "private Polish Army," was founded in Galicia, under the auspices of the Polish Socialist party.

At the beginning of the World War, Pilsudski thought the Central Powers would defeat Russia, and in turn France would conquer the Central Powers. In accordance with his convictions, he sided with the Central Powers, hoping that his private army, or legion, would be of sufficient support to his allies to secure their cooperation in the freedom of Poland. He broke with the Central Powers when they attempted to remove his troops from Polish soil and send them to the western front. As a result of trouble with the Austrian commanders, he resigned his command of the Polish legions in July, 1916, and by so doing showed Germany and Austria that Polish people distrusted the promises and sincerity of the Central Powers. This act was more than anything else responsible for the recognition of Polish independence by the Central Powers on November 5, 1916.

In the provisional government then established, Pilsudski was made Minister of War. In July of the following year, he was arrested and imprisoned in the fortress of Magdeburg, because his men refused to take the oath of allegiance to Germany and Austria. German revolutionary authorities released him in November, 1918, and he returned to Warsaw to assume full power as the first President of the Polish republic. He soon formed an army sufficient to maintain the independence of Poland, which was threatened by all the bordering powers. He was given the power of a dictator, and made every effort in behalf of the welfare of his country, being backed by his army. Wars with the Ukrainians, Czechoslovaks, and Bolsheviks followed in 1919 and 1920, in which Pilsudski and his men were victorious, thereby averting a possible new war involving all Europe. He resigned the Presidency in 1922, expecting to retire to private life.

In 1926, as a result of corrupt government and financial difficulties in Poland, Pilsudski engineered a *coup d'état* which compelled the

Ministry to resign, and though he was offered the Presidency, he refused it on the ground that his majority was not great enough. However, he saw to the election of his friend Moscicki as President, and dictated the Cabinet appointments, securing for himself the position of commander in chief of the armies of Poland without check from the Cabinet or Diet. In September, 1926, opposition to his régime resulted in his taking over the Premiership. His aggressions against Lithuania, which he believed should belong to Poland, gave Europe cause for uneasiness in the fall of 1927, but the good offices of the League of Nations brought a measure of peace to the two countries. See POLAND (History).

PIMA, *pe' mah,* a variety of cotton grown in Arizona. See COTTON.

PIMA. See INDIANS, AMERICAN (Most Important Tribes).

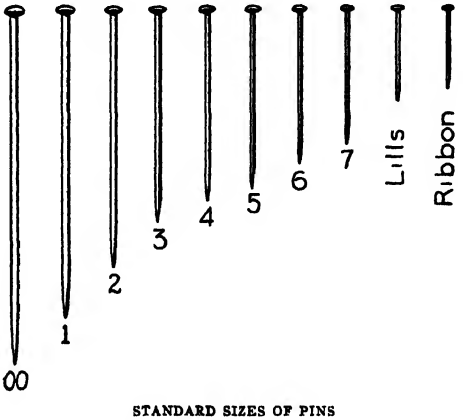
PIMENTO, *pih men' toh,* the popular name of a small evergreen tree of the myrtle family, from which is obtained a spice known as *allspice, Jamaica pepper,* or *pimento.* The name is derived from *pimienta,* the Spanish word for peppercorns, to which the spice bears a resemblance. The tree is native to the West Indies; most of the commercial spice is obtained in Jamaica. The pimento grows to a height of from twenty to thirty feet; occasionally it is forty feet tall. The slender, upright trunk has many branches at the top and is clothed in a smooth, gray bark. The shining green leaves are lance-shaped; they contain an essential oil, and are aromatic when fresh. The fruit is a small berry, black, glossy, sweet, and juicy when ripe, and about the size of a black currant. It is the unripe berry that is used for the spice of commerce, for the fruit loses much of its aromatic property by maturing. The process of preparing the berries for the trade is described in the article ALLSPICE. G.M.S.

Scientific Name. The pimento belongs to the family *Myrtaceae,* and is known botanically as *Pimenta officinalis.*

PIMPLE. See ABSCESS; ACNE.

PIN. A pin is such a commonplace device that we never consider its value until we are sorely in need of one. Nevertheless, there are over 75,000,000 gross of toilet pins made in the United States alone every year; in addition, about 10,000,000 gross of safety pins are manufactured yearly. Before the advent of bobbed hair, over 25,000,000 gross of hairpins were a part of the annual product, but the hairpin industry suffered a serious decline when women adopted the new style of hairdressing. The value of the entire pin output is about $9,000,000 a year.

Pins were not always so plentiful or so cheap as they are now. According to tradition, there was a time when the people of England were taxed to provide the queen with money to buy pins. This same tradition tells us that it was from this custom that the term *pin money* was derived [for a variant of this story, see MONEY (Unusual Terms)]. Be this as it may, we know that in early times thorns, pointed sticks, bones, and other articles were used for pins. In Egyptian tombs, pins of bronze, highly ornamented, have been found, some of



STANDARD SIZES OF PINS

them six or eight inches in length. The immediate forerunner of the toilet pin in common use to-day was a pin made of brass wire. It had a head consisting of a coil of fine wire wound around one end of the shank and soldered to it; there are people still living who remember pins of that style. These were made by hand tools requiring several operations and as many laborers.

Up to the beginning of the nineteenth century, all the pins used in the United States were imported, and in 1775 a prize was offered for the first twenty-five gross of domestic-made pins. Timothy Harris, of England, made a solid-headed pin in 1797 by molding the heads; in 1824 Lemuel Wright, an American, obtained a patent for a machine to make pins out of a single piece of wire, but he took out his patent in England, where solid-headed pins were first made. Wright's machine has been greatly improved, but its invention was the first step in the modern method of pin manufacture. Dr. John Ireland Howe, a New York physician, invented a machine in 1831 for making perfect solid-headed pins, and later organized a company at Derby, Conn., for their manufacture.

Pin-Making. The pins used to-day are turned out with incredible rapidity by an ingenious machine into which iron, brass, or steel wire is fed from a reel. The wire is straightened, cut into proper lengths, and seized by lateral jaws beyond which just enough of the wire protrudes to form a head. A blow from a die flattens and shapes this end into the head. The pins are then carried forward until the lower end is brought into contact with revolving files, which

grind the point. The pins are thus shaped, and only the finishing remains to be done. This is accomplished by boiling them for several hours in a preparation of tin. They are then washed and given a higher polish by being rolled in a cylinder filled with bran or fine sawdust.

The machine which sticks the pins into the papers in which they are sold is hardly less ingenious than that which forms them. It crimps the paper and thrusts the pins in place at the same time. From a hopper the pins are conveyed to a plate containing as many slots as there are to be pins in a row in the packet. The paper, properly crimped, is brought against the pointed ends of the row of pins, and a tap on the heads thrusts the pins into place.

PIÑA, *pe' nyah,* pineapple fiber. See PHILIPPINE ISLANDS (The Cities: Iloilo); PINEAPPLE.

PINCHING BUGS. See STAG BEETLE.

PINCHOT, *pin' sho,* GIFFORD (1865-), a governor of Pennsylvania, but of greater fame as a pioneer in movements for conservation of America's timber supply. Pinchot was born at Simsbury, Conn., of well-to-do parents. After graduating from Yale, where he earned the reputation of being "mad on trees," he studied forestry in France, Germany, Switzerland, and Austria. On his return to America, he began his first systematic work in forestry at Biltmore, N. C., on the estate of George W. Vanderbilt. In 1896 he was made a member of the National Forest Commission, and in 1898 was appointed chief of the Division of Forestry. In 1901 this became the Bureau of Forestry, and after 1905 was known as the Forest Service of the United States Department of Agriculture. Pinchot served as its chief until 1910, when he was elected president of the National Conservation Committee. Besides serving on various other committees, after 1903 he was a professor of forestry at Yale. During the World War, he was a member of the United States Food Administration.



Photo, Chandler

GIFFORD PINCHOT

In 1922 Pinchot was elected to the governorship of his state, on the Republican ticket, and served until 1927. In this post he was the friend of labor in the anthracite-coal struggles over hours of work and wages, and he ardently advocated enforcement of the prohibition law.

Literary Activity. Pinchot wrote *The White Pine* (in collaboration with H. S. Graves), *The Adirondack Spruce, A Primer of Forestry,* and magazine articles.

Related Subjects. The reader is referred in these volumes to the articles CONSERVATION and FORESTS AND FORESTRY.

PINCIO, *pin' cho.* See ROME (The Seven Hills).

PINCKNEY, CHARLES COTESWORTH (1746-1825), an American statesman and soldier of the Revolutionary and early national periods. He was born at Charleston, S. C., and was educated in England and in France. At the time of the break between England and the colonies, he was practicing law in Charleston. Pinckney was an enthusiastic member of the first provincial congress called by South Carolina, and he entered the army when hostilities began. During the war he served as aid-de-camp to Washington and rose to the rank of brigadier general; when peace was declared, he returned to his law practice. Later, he was a member of the Constitutional Convention in Philadelphia, and of the convention that framed a constitution for the state of South Carolina.

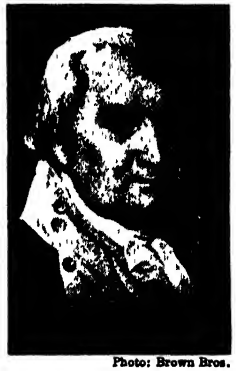


Photo: Brown Bros.

CHARLES C. PINCKNEY

In 1796 Pinckney was appointed United States minister to France, and took part in the negotiations with Talleyrand concerning relations between France and the United States. In this connection he is said to have uttered the famous reply to Talleyrand's hint for a bribe—"Millions for defense, but not one cent for tribute." See X Y Z CORRESPONDENCE.

PINDAR (about 522-443 B.C.), the greatest lyric poet of ancient Greece. He belonged to a noble family and lived at Thebes, in Boeotia. His poetry is more representative of Greece as a whole than that of any other Greek writer, largely because he traveled more widely. Rulers in all parts of Greece sent for Pindar from time to time to compose for them poems celebrating their own glory or that of their states; and he was so much beloved and honored that when Alexander the Great razed Thebes to the ground, and all the other houses were destroyed, that of Pindar was left standing. The poet Milton notes the honor done his memory in these words:

> The great Emathian conqueror bade spare
> The house of Pindar.

His style was magnificent, and no translation into a modern language can give an adequate idea of the music of his lines. He was the first Greek writer to proclaim the immortality of the soul and to portray a judgment after death. Many of his lyrics were composed to

be sung by a trained chorus of youths and maidens. There are extant, practically entire, four books of triumphal hymns composed in honor of the victories at the Olympian, Pythian, and other great Greek games; also, various fragments of hymns to the gods, processional odes, dancing songs, dirges, and eulogies. Pindar lived at the same time as another great lyric poet—Simonides (which see).

PINDUS MOUNTAINS. See GREECE (Physical Features. Surface and Rivers).

PINE, the name of a family of cone-bearing evergreen trees, distinguished as the oldest living trees that have descended from the forests of geological time. Within this great family, which includes larches, spruces, hemlocks, firs, and others (see CONE-BEARING TREES), is the genus *Pinus*, made up of eighty different species. It is the trees of this genus that we usually have in mind when we speak of the pines. Over half of these species grow in America, and they are found from the Arctic Circle to the high altitudes of the tropics.



Photo: Visual Education Service

A TYPICAL STAND OF PINE TREES

The pines may be distinguished from the rest of the cone-bearing trees by the arrangement of their needles; these are borne singly or in groups of two to five, and have paperlike sheaths around their bases. The pines called "soft," because of their soft wood, shed these sheaths when the needles reach full growth, but the resinous "pitch" pines keep them until the leaves fall. While the trunks are straight and tall, sometimes reaching 250 feet, the shapes of the trees vary from round to pyramidal; the lengths of the cones range from one to eighteen inches or more. Although the pines thrive in almost any soil and place, they prefer sandy uplands, and can live but a short time in unusually smoky cities, where, it is believed, the gases choke them. To the pine genus belong some of the world's most important timber trees; many species, moreover, are valued for ornamental purposes.

Important Species. Foremost among all the pines is the *white pine* of Canada and the United States. Unsurpassed by other pines in beauty, rapidity of growth, and value and durability of timber, the white pine has suffered greatly from the lumberman's ax, and the magnificent virgin forests of the Northeast have been largely cut down. It is probable, however, that modern methods of replanting, aided by natural reforestation on cut-over areas, will save this noble tree from extinction (see the articles FORESTS AND FORESTRY).

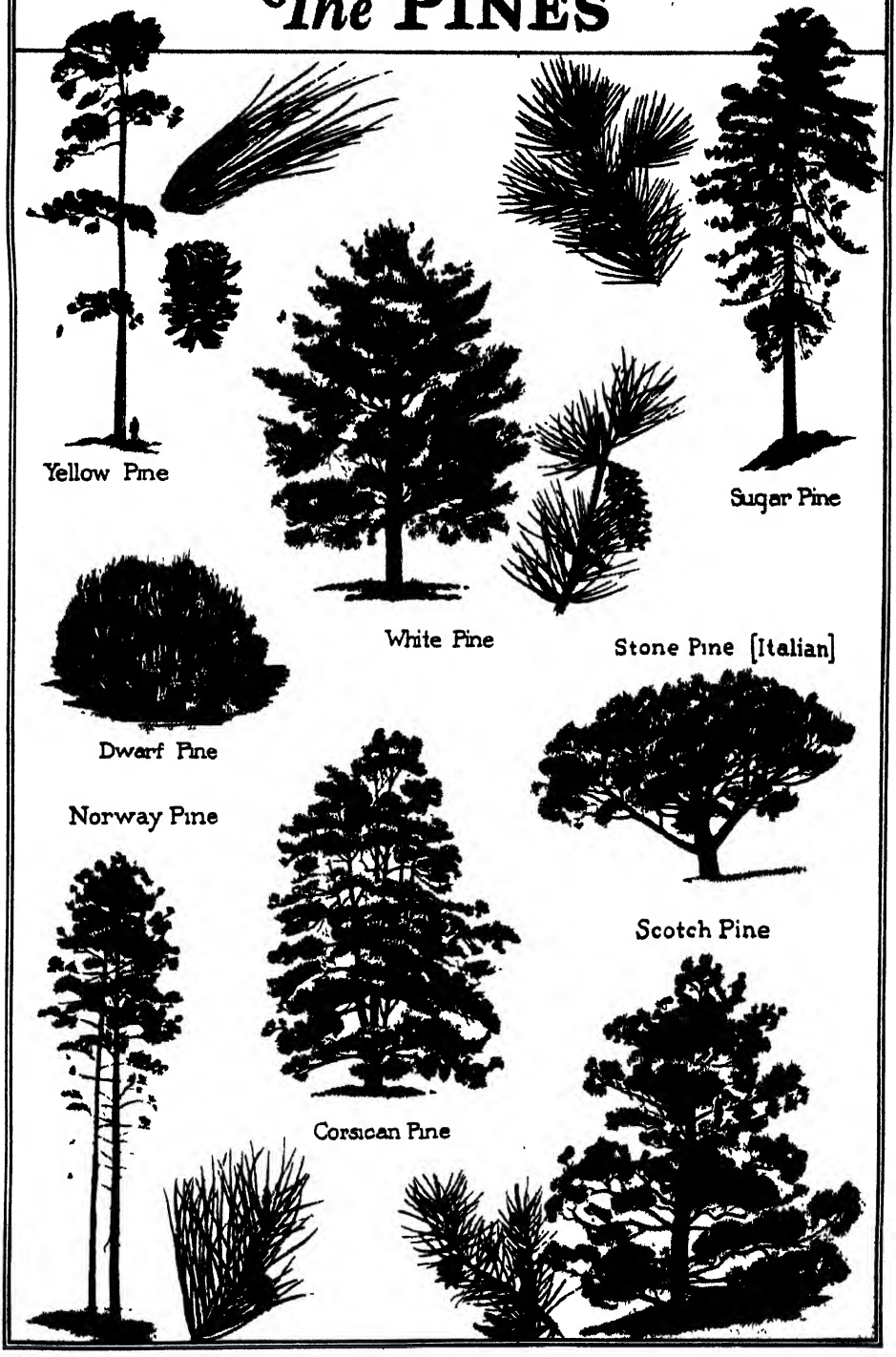
From Nova Scotia to Manitoba, southward through New England and along the Alleghenies, and westward to Minnesota, the white pine grows, a distinctive and attractive tree. It is the only eastern pine whose needles are borne in groups of five, and on the trees they have a delicacy and softness and a bluish-green color not seen in the foliage of other pines. The bark, too, is different, being exceptionally smooth. In the forest the pine trunks are tall, straight columns whose branches begin near the tops of the trees, but in the open, where it has room, the white pine sends out lower branches, and sometimes the trunk itself divides into two or more limbs.

The wood of this pine is soft but compact, straight-grained and easily worked, and takes a fine polish. It can be readily painted or varnished, and so is admirable for interior finishing.

Masts and the spars of vessels, furniture, and shingles are also made from it. The bark yields a sap that is used in cough mixtures. Maine chose the cone and tassel of the tree as its state emblem. In England and on the Continent, the white pine is extensively planted as an ornamental, and is there called *Weymouth pine*, from the man who introduced it into Great Britain.

The *Georgia*, *yellow*, *Southern*, or *long-leaf* pine, most important and widely spread of southern timber trees, ranking next to the white pine, is found in a belt about 125 miles wide, from Mississippi to Virginia. It may be recognized by its orange-brown branches, large cones, and needles more than a foot long. From the needles are obtained an oil much like turpentine, and a fiber used for making bagging and for stuffing pillows. This species, which is of great value for its resinous products as well as other uses, often grows more than 100 feet high.

The PINES


Yellow Pine
White Pine
Sugar Pine
Dwarf Pine
Stone Pine [Italian]
Norway Pine
Scotch Pine
Corsican Pine

The *great sugar pine*, one of the most important timber trees on the Pacific coast, and one of the most beautiful of its family, reaches a height of 220 feet, with a diameter of about ten feet. The satiny, golden lumber of this tree is used principally for furniture and interior finishing. White sugar crystals form on the wood when it is burned, and from this fact the tree takes its name. Among many other species, some of those best known are the *loblolly*, *western yellow*, *western white*, and *Norway* pines. Of European pines, the *Scotch* and *Corsican*, or *black*, are familiar.

Pine Industry. The pine industry is one of the greatest, in spite of the fact that metal is now used for many purposes formerly requiring wood. Wooden articles, however, are not the only products of the trees. The naval-stores industry, which includes the gathering of turpentine and tar, is now of great importance to the United States and other countries. A forest of 10,000 long-leaf pines should yield annually for four years about 400 barrels of liquid resin, from which tar, pitch, turpentine, and rosin are extracted. In times past the waste involved in resin gathering was serious, but improved methods have reduced it and have put to good use many constituents which formerly escaped in steam and smoke. Stumps and branches left in pine forests after the woodsmen have done their work are now turned into slabs, lath, shingles, and bundles of fagots which are sold for fuel; and a wonderful invention has made it possible to extract ethyl-alcohol, the highest grade known, from sawdust. In the South, long-leaf pine saplings are shipped in large quantities for Christmas greens, a practice which threatens the supply of that species. G.M.S.

The Pine Tree in Literature. Among many tributes to the pine, the following, by Robert Service, the Canadian poet, is especially appropriate:

On the flanks of the storm-gorged ridges our black battalions massed,
We surge in a host to the sullen coast, and we sing in the ocean blast;
From empire of sea to empire of snow we grip our empire fast.

To the niggard lands were we driven, 'twixt desert and foes are we penned;
To us was the Northland given, ours to stronghold and defend;
Ours till the world be riven in the crash of the utter end;

Ours from the bleak beginning, through the aeons of deathlike sleep;
Ours from the shock when the naked rock was hurled from the hissing deep;
Ours through the twilight ages of weary glacier creep.

Wind of the East, Wind of the West, wandering to and fro,
Chant your songs in our topmost boughs, that the sons of men may know
The peerless pine was the first to come, and the pine will be last to go!

Scientific Names. The pine family is *Pinaceae*. The white pine is *Pinus strobus*; the Georgia pine, *P. palustris*; the great sugar, *P. lambertiana*; the loblolly, *P taeda*; the western yellow, *P. ponderosa*; the western white, *P. monticola*, and the Norway, *P. resinosa*. The Scotch pine is *P. sylvestris*; the black pine, *P. nigra*.

PINEAPPLE, a delicious and fragrant fruit native to tropical America. It received its name from its resemblance to a pine cone, and is usually about the size of a coconut, though the very large varieties may weigh from sixteen to twenty pounds. Under its thorny, reddish skin there is a firm, pale-yellow meat. Protected by its hard covering, it will stand more rough handling and keep longer than any other tropical fruit, and it can be obtained throughout the year. Its excellent and distinctive flavor makes the pineapple a favorite dessert and salad fruit.



THE PINEAPPLE

The pineapple plant bears a single thick stalk with stout, toothed leaves. The ripe head results from a thickened rachis (spine, or vertebral column) and embedded fleshy bracts and berry, the flowers being largely abortive. Externally, the solid fruit is covered with the tips of the thick, hard floral bracts and crowned with a tuft of smaller leaves. Only one fruit is borne by any one stalk, but the same root may produce more than one fruiting stem.

The pineapple was introduced into Europe by the Spaniards after the explorations in South America; the earliest mention of its use in England was made by John Evelyn in his *Diary*, in which he speaks of having tasted





A Splendor of Green and Pink. When pineapples are ripening, a field presents a brilliant color effect. Above is a close-up view of rows of pineapples, showing the method of cultivation; below, a view of a field.

a pineapple from Barbados at the table of Charles II. For many years it was cultivated in private gardens in England and on the Continent, but owing to the great development of pineapple culture in the tropics, the hothouse plant is now rare. The European markets are largely supplied by the plantations of Northern Africa, the Canaries, the Azores, and the West Indies, and Queensland is the source of the Australian supply. Pineapples are also produced for market in Florida, but the crop is much lighter than formerly, owing to exhaustion of the soil and abandonment of plantations, to losses from freezing and insects, and to the use of poor slips in propagation. Most of the American supply of canned pineapple comes from the Hawaiian Islands. Considerable pineapple shipments are also received from Porto Rico, Cuba, the Bahamas, Jamaica, San Salvador, and Trinidad.

Pineapples do not ordinarily produce seed. For commercial production they may be propagated by plantings of *crowns* (the tufts of leaves at the top of the fruits); by use of *suckers* (from near the base of the stalks); from *slips* (at the base of the fruits); and from *ratoons* (bud roots). Suckers are most commonly used. Plantations bear from eight to ten years before they require resetting, as the old plants are replaced by suckers. The fruits are harvested by hand, and the workers, who wear heavy canvas gloves and leggings to avoid injury from the spines, do the cutting with hooked knives. Pineapples for markets a long distance away are harvested before they are ripe and allowed to mature in the transit. The main harvest season in Florida is May to July. A delicate fabric, the piña muslin of the Philippines, is woven from the fiber of the larger leaves. B.M.D.

Scientific Name. The pineapple belongs to the family *Bromeliaceae*. Its botanical name is *Ananas sativus*.

PINE BARRENS. See SOUTH CAROLINA (The Land).

PINE BLUFF, ARK. See ARKANSAS (back of map).

PINEDA, *pi ne' dah,* ALVAREZ DE. See LOUISIANA (History).

PINEDO, MARCHESE DE. See AIRCRAFT (First Great Feats in Flying: Four-Continent Flight).

PINE MARTEN. See SABLE, for classification.

PINE RIDGE. See NEBRASKA (The Land).

PINERO, *pih nehr' o,* SIR ARTHUR WING (1855-), an English dramatist, born in London, the son of a Jewish solicitor. He began to prepare himself for the profession of law, but soon became interested in the theater and appeared as an actor in Edinburgh, in 1874. Later, he was a member of the Lyceum Company of London, gaining much valuable knowledge, under Henry Irving, of stage life and stagecraft. This experience doubtless had much to do with his subsequent success as a writer of plays. He was knighted in 1909.



Photo Brown Bros

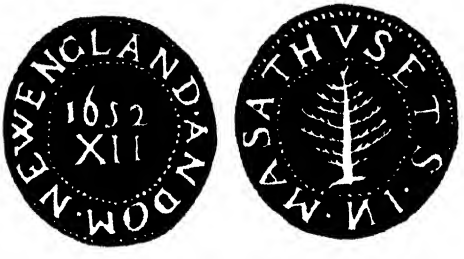
ARTHUR PINERO

His Plays. These include *The Second Mrs. Tanqueray, Trelawney of the Wells* (revived in 1925 with an all-star cast), *The Notorious Mrs. Ebbsmith, The Profligate, The Squire, Hss House in Order, Mid Channel,* and *The Mind-the-Paint Girl.*

PINES, ISLE OF. See ISLE OF PINES.

PINE-TREE FLAG. See FLAG (United States Flag).

PINE-TREE SHILLING. From 1652 to 1682 there were coined in Massachusetts shilling pieces which bore on one side the date of issuance, with the words *New England,* and on the other side a pine tree, surrounded by the



THE PINE-TREE SHILLING
Obverse and reverse.

word *Masathusets.* These coins, which were of silver and almost as large as a modern half-dollar, were at first called Boston shillings, or Bay shillings, but it is the later name of "pine-tree shilling," first used in 1680, by which the coin became known in history.

The original coins issued in Massachusetts had no raised edge, and had thus suffered much from clipping, and it was to prevent this evil that the pine-tree money was surrounded with a double border with the words "Masathusets" and "New England" between. Threepenny and six-penny pieces similar to the pine-tree shillings were also coined.

Literary Reference. In *Grandfather's Chair* Hawthorne presents an interesting tale of colonial days in which the famous old pine-tree shilling figures largely.

PINE TREE STATE, a popular name applied to Maine (which see).

PING-PONG is a miniature game of tennis, played on a table. Almost any table can be used, though there are regulation sizes of

playing surfaces which range from five and a half to nine feet in length and from three to five feet in width. The height of the little net should be three-fourths of an inch for each foot in length of the table. The balls and bats are miniature copies of those in outdoor use. With a few exceptions, the rules of the game are the same. Volleying is not allowed, the stroke is underhand, and but one ball is served.

PINK. The pinks are a genus of beautiful flowering plants which botanists have named *Dianthus*. While the blossoms are often seen in shades of pink, the name *pink*, according to many authorities, is used in the sense of *pierce*, or *puncture*, and refers to the crinkled edges of the petals. The genus includes several favorite garden flowers, admired equally for their beauty and their delicate scent. The spicy fragrance of many old-fashioned gardens comes from beds of clove pinks, clustered in their grasslike leaves, and showing exquisite combinations of pink, white, and reds. The cultivated sorts include the *carnation* (which see); derivatives of the *common*, or *feather*, pink; *clove pinks*; scentless *China pinks*; small-flowered *maiden pinks*; and *sweet Williams*, or *bunch pinks*. The species are propagated from seeds and cuttings. B.M.D.



And I will pu' the pink, the emblem of my dear,
For she's the pink o' womankind, and blooms without a peer —BURNS.

(Above, a clove pink.)

Scientific Names. The genus belongs to the family *Caryophyllaceae* *Dianthus caryophyllus* is the parent species of the cultivated carnation and clove pinks; the common pink is *D. plumarius*, the China, *D chinensis*; the maiden, *D deltoides*; the sweet William, *D. barbatus*.

PINK BOLLWORM, an insect first seen in the United States in Texas in 1927, and later in Louisiana. It is believed to have been imported into Mexico in 1911 from Egypt in shipments of cottonseed, and is a serious pest of cotton, large sums of money having been expended in an effort to eradicate the insect in America. It looked for a time as if this effort would be successful, but the insect has appeared in a new location, and the effort to exterminate it is being continued.

The adult is a small grayish-brown moth, with a wing expanse of about three-fifths of an inch. The larva is about one-half inch in length. The eggs are deposited on all parts of the plant; upon hatching, the young larvae enter the squares and feed upon the pollen and fleshy parts of the flower. The infested flowers do not open normally, and many of them fall. Later, the larvae enter the forming bolls, eat the seeds, burrow through the lint, check the growth of the bolls, and cause them to rot. In spring and summer, the larvae mature in eight to sixteen days; those hatched in fall and winter may remain as larvae from a few months to two years or more. The summer larvae leave the bolls when grown, and pupate under trash or two or three inches in the soil. The pupal period lasts from six to twenty days. The resting larvae pupate in the ground or in the seed and lint inside of the boll. The insect could easily be carried to any distance while in this resting larval stage. Breeding begins early in spring and continues until frost. There may be from four to six generations a season. No adequate methods of control have been found. W.J.S.

Scientific Name. The scientific name of the pink cotton bollworm is *Pectinophora gossypiella*, of the order *Lepidoptera*.

PINKERTON, ALLAN (1819-1884), a notable American detective, was born in Scotland, but spent most of his life in the United States. He emigrated to Canada in 1852, and in that same year settled in Chicago, where he became deputy sheriff, and later head of a world-famous detective agency, which still exists. He guarded Lincoln on his journey from Springfield to Washington, where he was inaugurated. Pinkerton's work was unusually successful, and soon after the outbreak of the War of Secession, he was given the task of organizing a Federal Secret Service, of which he was made the chief. He never gave up his work in Chicago, however, and established branch agencies in New York and Philadelphia.

In the last quarter of the nineteenth century, labor troubles growing out of the changing industrial system caused many disturbances and strikes. Pinkerton organized groups of armed men known as "Pinkerton men," which he hired out to employers on a per diem basis to break strikes and protect property. See SECRET SERVICE.

His Stories of Crime. Pinkerton's writings include *The Molly Maguires and the Detectives*, *The Spy of the Rebellion*, *Criminal Reminiscences*, and *Thirty Years a Detective*.

PIN MONEY. See MONEY (Unusual Terms Applied to Money); PIN.

PINNA, *pin' ah.* See EAR (The External Ear).

PINNACLE, MOUNT. See SOUTH CAROLINA (The Land).

PINNACLES MONUMENT. See MONUMENTS, NATIONAL.

PINNATED GROUSE. See PRAIRIE CHICKEN; GROUSE.

PINTA, *peen' tah,* THE. See COLUMBUS, CHRISTOPHER.

PINXTER, *pinks' tur,* **FLOWER.** See AZALEA.

PINZON, *peen thone',* VICENTE, first Spaniard to reach the coast of Brazil. See BRAZIL (History).

PIONEER TRAILS. See TRAILS OF EARLY DAYS.

PIPE, TOBACCO, a small bowl, fitted with a hollow, reedlike stem, for the smoking of tobacco. Pipes of a very simple kind had probably been used in England for the smoking of medicinal herbs before tobacco became popular, but it was the introduction of tobacco that developed the real art of pipe-making. The American Indians, who had smoked tobacco from the most ancient time, carved the pipe bowls out of stone or shaped them of clay, and often decorated them quite gayly with figures of men and beasts. The pipe of the Indian was more than a relaxation; it had a ceremonial use as well, and the smoking of the peace pipe was a most important event.

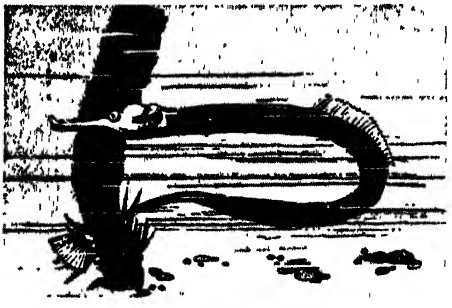
When the Europeans acquired the habit of smoking, they used first either a pipe of silver, or a walnut shell with a straw thrust into it, but better devices were soon discovered. As both clay and brier root take up much of the unhealthful nicotine liquor before it reaches the mouth, pipes came to be made of these substances. For finer pipes, meerschaum was first used in Germany, but the custom soon spread to other countries. Sometimes the bowls alone are made of meerschaum, sometimes the entire pipe, excepting only the mouthpiece. The mouthpieces were formerly of amber, silver, or ivory; hard rubber, bakelite, and similar materials are now commonly used. Holland early took the lead in pipe-making; it still produces porcelain pipes with huge bowls, often painted in brilliant colors.

Orientals smoke the most curious of pipes—the hookah. The bowl is fitted into an air-tight vase partly filled with water, and a tube passes downward into the water. A flexible tube with a mouthpiece is fitted into the side of the vase, and the smoke passes through the water before it enters the mouth. It is thus cooled and is rendered less harmful to the system.

Related Subjects. The reader is referred in these volumes to the following articles:

Calumet Meerschaum Tobacco

PIPEFISH, the name applied to a group of fishes which have a characteristic tubelike snout, ending in a small, narrow, toothless mouth, opening upward. A remarkable feature of the family is a pouch in the male, in which the eggs are placed by the female; there they are kept until hatched. The young also remain there until able to care for themselves. The body of the pipefish is long, slim, and snakelike, is covered with bony plates, and varies from eighteen inches to three feet in length. Pipefish are found in the warmer seas and are related to the hippocampus (which see). L.H.



THE PIPEFISH

Scientific Name. The common pipefish of the Atlantic coast is *Syngnathus fuscus*

PIPE LINES. See PETROLEUM.

PIPE OF PEACE. See CALUMET; PIPE, TOBACCO.

PIPE ORGAN. See ORGAN.

PIPE SPRING MONUMENT. See MONUMENTS, NATIONAL.

PIPIT, *pip' it,* OR **TITLARK,** a small American song bird, about seven inches in length and of quiet, brownish-gray plumage. It has a characteristic graceful walk and a habit of wagging its tail. This peculiarity puts it in the family of the wagtails, but it also has a delightful habit of the larks, that of singing while on the wing (see LARK; WAGTAIL). It is found throughout North America, wintering in the Central states and south to Mexico and Central America. It nests far to the north, and



Photo Visual Education Service

THE PIPIT, OR TITLARK



FOOD OF THE PIPIT

on high mountains in the United States. Its nest, built of grasses, is placed on the ground, and the eggs, four to six in number, are grayish-white or bluish-white in color, thickly speckled with dark brown. The pipit helps the farmer by devouring insects. It also feeds on small shells and seeds. D.L.

Scientific Name. The pipit belongs to the family *Motacillidae*. It is known scientifically as *Anthus spinoletta rubescens*.

PIPPIN, *pip' in*. See PEPIN.

PIQUA, *pik' wah*, OHIO. See OHIO (back of map).

PIQUET, *pe ket'* or *pik' et*, a game of cards played by two persons, with a deck from which the twos, threes, fours, fives, and sixes have been removed. The players draw for first deal, low card winning the deal The dealer shuffles the cards and deals twelve to each player, two at a time; the remaining eight cards constitute the stack, from which the discarded cards are replaced. Each player is required to discard one card; the dealer has the privilege of discarding three, and the non-dealer may discard five. The discard is made in view of making as many combinations of cards of the same suit as possible. Players must take from the stack as many cards as they discard, so that when the play begins, each has twelve cards. Sometimes six hands may be considered a game, and the score is determined by the difference between the two hands, plus one hundred for game. A player must follow suit if possible, and the winner of one trick leads for the next. There are no trumps, all suits being of equal value. The rules for counting are complicated.

Before discarding, if either player discovers he has nothing but spot cards in his hand, he can claim *carte blanche* and score 10. The ace has a value of eleven, and each face card counts ten, while the others are valued according to their spots. Various combinations, such as four cards of a kind, a regular succession (as 7-8-9-10), three of a kind, etc., have a definite assignment of values.

In playing, the leader of each trick counts 1 for his card, the winner of the trick also counts 1, and the winner of the last trick counts 2; the player who succeeds in winning more than six tricks counts 10 for cards. If a player wins all the tricks, he wins a *capot*, which counts him 30 additional. Special and complicated rules govern the winning of a *pique*, 30 points, and a *repique*, 60 points. See CARDS, PLAYING.

PIRAEUS, *pi re' us*. See GREECE (Principal Cities).

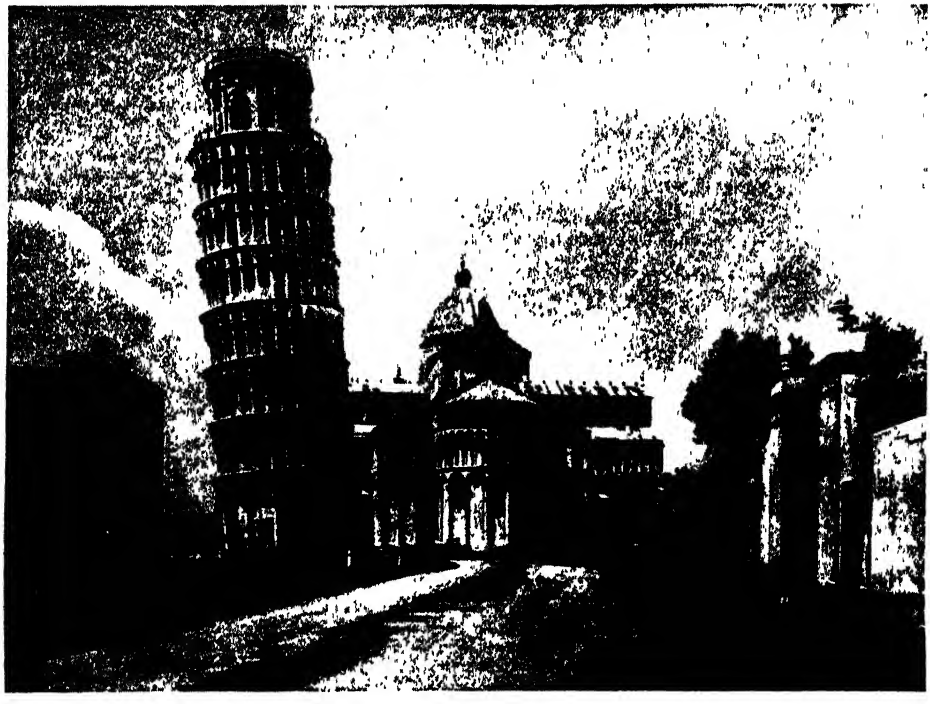
PIRATES AND PIRACY. In the days when piracy flourished, pirates were the freebooters of the seas, corresponding to bandits on land. They owed allegiance to no banner but their own—the black flag. Their recklessness and cruelty have been told in countless stories of adventure, nowhere more thrillingly than in Stevenson's *Treasure Island*. Piracy is a crime punishable by death, in international law, and it has been banished from the seas, for the ships of strong nations have become the police force of the world. No advanced civilized nation of modern times has countenanced acts of piracy, but early in the nineteenth century, the United States had to fight with Tripoli, Algiers, and Tunis to protect its ships from piratical attacks in the Mediterranean (see BARBARY STATES). A distinction is made between piracy and privateering (see PRIVATEER).

PISA, *pe' sah*, or *pe' zah*. See ITALY (The Cities).

PISA, COUNCIL OF, the name of a council called at Pisa, Italy, in 1409, to terminate the Great Schism of the West, which had agitated the Roman Catholic Church for thirty years. At that time the Church was divided in its allegiance to two Popes, Gregory XII and Benedict XIII. At the Council of Pisa, the rival Popes agreed to abdicate, so that a new Pope might be chosen with undisputed title. At the appointed time, however, they failed to comply with the agreement, and both were deposed. Alexander V was elected, but Gregory and Benedict refused to waive their rights, rendering the condition worse; the Schism continued eight years longer, and was then ended by another council which met at Constance and elected Martin V to the Papal throne. See POPE (Vicissitudes of Papal Power).

PISA, LEANING TOWER OF. This celebrated marble bell tower, in the Italian city of Pisa, is worthy of rank among the seven wonders of the modern world. Begun in 1174, and completed in 1350, the structure commenced to dip after the first three galleries had been constructed. The slant of the tower, which is about fourteen feet from the perpendicular, increased an additional foot in the last century. Toward the end of 1928, the Italian government began work which will ultimately give to this notable example of Romanesque architecture a broad, secure footing. The tower is not to be straightened, but its foundation is to be strengthened. For centuries the "falling tower," as engineers have called it, has been slowly sinking vertically into the soft river-valley sediment on which it rests. The plan is to inject cement in liquid form through pipes inserted under the tower. After the completion of preliminary experiments, on spots near enough to the tower without involving direct risks, the soil directly under the structure itself is to be treated, in the light of the experience gained from these test experiments.

Constructed entirely of white marble, the tower rises to a height of 179 feet, having the



THE LEANING TOWER OF PISA

At the right are shown the cathedral and baptistery. The view shown is the one that the traveler sees from a railroad train.

bells in its uppermost eighth story. The walls are thirteen feet thick at the base, and between six and seven feet thick at the top. Semicircular arches, supported by fifteen columns, surround the lowest portion. Above these rise six arcades, each with thirty columns; the top section has twelve columns. An inner staircase, of nearly 300 steps, leads to the top, from which a fine view of the picturesque city of Pisa and the Mediterranean beyond is obtained.

The tower was intended as a bell tower for the near-by cathedral, which is of equal fame, as is also the baptistery in the same square. Galileo (which see), a native of Pisa, used the leaning tower in his experiments to determine the velocity of falling bodies.

PISANO, *pe zah' no,* NICCOLA, GIOVANNI, AND ANDREA. See SCULPTURE (Italy: Revival of Sculpture).

PISCATAQUA, *pis kat' ah kwah,* **RIVER.** See NEW HAMPSHIRE (The Land).

PISCES, *pis' eez.* See ZOÖLOGY (Divisions of the Animal World).

PISCES, *pis' eez,* THE FISHES, one of the constellations of the zodiac, without one conspicuous star. It is notable only as containing the first of Aries, or the vernal equinox. The constellation Pisces now occupies the sign of Aries, the first sign of the zodiac. The sign Pisces is the twelfth of the zodiac, and into it the sun enters about February 19. The symbol of Pisces is ♓. According to Greek mythology, the Fishes are Venus and her son Cupid, who were turned into fish when fleeing from the monster Typhon. The old Babylonian year of 360 days was supplemented every six years by an extra month; to this month was given the sign of the *Fishes of Ea,* or Dagon, the fish god celebrated in Chaldean legends of the Deluge. For illustration, see ASTRONOMY (The Heavens in Autumn and Winter). See, also, ZODIAC. F.B.L.

PISCICULTURE, *pis' i kul ture.* See FISH (Fish Culture).

PISGAH, *piz' gah,* a mountain range, east of the Jordan, from which Moses viewed the Promised Land (*Deuteronomy* XXXIV, 1). It was here that Balak built seven altars for Balaam and from here he invited him to survey the hosts of Israel. Mount Nebo, upon which Moses is supposed to have been buried, is one of the peaks of this range. To the southwest of Pisgah may be seen the northern half of the Dead Sea. See MOSES.

PISISTRATUS, *pih sis' trah tus* (about 612-527 B.C.), a tyrant of Athens, the son of Hippocrates, and a friend and relative of Solon.

Being very ambitious for power, he became leader of the party of the Highlands—one of the three parties into which Athens was divided. The others were the party of the Plain and the party of the Seaboard. The faction to which Pisistratus belonged was composed chiefly of the poor and discontented citizens, and their favor was easily won by his generosity. Claiming that he had been subjected to violent attacks, Pisistratus succeeded in gathering a large number of supporters; with this strength he seized the Acropolis in 560 B.C. and declared himself tyrant of Athens. Solon died shortly thereafter, and Pisistratus endeavored to carry out his constitution, but in five years was forced by his opponents to leave the country. He was twice reëstablished, permanently about 540 B.C., and on his death he entrusted his two sons, Hippias and Hipparchus, with the power he laid down.

As a whole, the reign of Pisistratus was distinguished for its beneficence, its support of the poor, and its patronage of literature. The scholars gathered at his court prepared a new edition of the poems of Homer. From the state revenue he was enabled to construct magnificent buildings and improve the water supply; the idle were set to work on plantations; and the poor were provided with food and clothing. A temple was erected to Dionysus in Limnae, a district to the south of the Acropolis, and a sanctuary to the god was constructed at the foot of the Acropolis. Athena was honored by a noble temple on the Acropolis; the Lyceum was built; and the magnificent temple to the Olympian Zeus was begun. See GREECE (History).

PISTACHIO, *pis tah' shih o,* or *pis ta' shih o,* a small tree native to Syria, cultivated chiefly in countries bordering on the Mediterranean Sea. Pistachio nuts, the stones of the olivelike fruit of the tree, are valued for their bright-green, oily kernels, the delicious flavor of which makes them popular for flavoring candies, cakes, and ices. Oil pressed from them is used in cooking. The tree has been successfully introduced into the southwestern part of the United States by the Department of Agriculture. Sicily is now the source of the best nuts. The bearing plants there are the result of grafting the pistachio on the wild turpentine tree, which belongs to the same genus. B.M.D.

Classification. The pistachio tree belongs to the cashew, or sumac, family, *Anacardiaceae.* Its botanical name is *Pistacia vera.*

PISTIL. See FLOWER (Flower Structure).

PISTON. See AUTOMOBILE; STEAM ENGINE.

PITCAIRN, *pit' kairn,* ISLAND, reminiscent of slave-ship days and inhumanity at sea, is situated in the Pacific Ocean, far east of Australia and about 2° south of the Tropic of Capricorn. It belongs to Great Britain. Carteret discovered it in 1767, and it was first colonized by nine of the members from the *Bounty* mutiny (see below), who with six men and twelve women, natives of Tahiti, landed there in 1789. Treachery and debauchery were prevalent for a number of years, and by 1808 all of the settlers were dead except John Adams, who had done his best to establish a successful and properly conducted colony, and several women and children. The colony was not discovered until an American vessel visited the island in 1808, having come upon it by accident. Seven years later, it was sighted by the captain of an English vessel, who came ashore and was impressed by the peace and tranquillity of the settlement.

In 1830 the islanders removed to Tahiti to escape a threatening drought, but returned to Pitcairn in a year. Formal possession by Great Britain was taken in 1839. In 1856 the islanders were all taken to Norfolk Island by British authorities, in compliance with their own request, which was made because the population was becoming greater than the island could maintain. Two years later, two families returned and were followed by others.

The soil of the island is fertile and produces sweet potatoes, yams, melons, bananas, coffee, and arrowroot. The latter is prepared and exported in small quantities, though the methods are antiquated. Goats and chickens are plentiful and run wild. The islanders are Seventh-Day Adventists, and speak a Tahitian dialect, though most of them understand English. The area of the island is about two square miles, and the last census, taken in 1914, showed 140 persons.

Bounty Mutiny. In 1789 a part of the crew of the *Bounty,* a British ship carrying young breadfruit trees from Tahiti to the West Indies, mutinied and put nineteen men, including Captain Bligh, at sea in an open boat. With few provisions and without instruments or maps to guide them, they drifted for three months over a distance of 3,600 nautical miles, suffering severe hardships, but no loss of lives, and finally landing at the island of Timor. The mutineers at first returned to Tahiti, but some, fearing capture, escaped to Pitcairn Island as described above. Of those who remained at Tahiti, twelve were captured by Captain Edwards, who was sent, upon the return of Captain Bligh to England, to find the mutineers. Six of the group were returned to England for court-martial, which resulted in the hanging of three in 1792. The last of the mutineers, John Adams, died in 1829. Lord Byron's poem, *The Island,* is based on the *Bounty* incident.

PITCH. See MUSIC (A Course of Lessons: Common Musical Terms).

PITCH, a dark-colored mixture of carbon and hydrogen obtained as a residue in the distillation of coal tar, of which it forms about two-thirds. Pitch is found naturally in asphalt beds. The resin obtained from certain ever-

green trees after the distillation of turpentine is also called pitch. Wood pitch is a by-product of the distillation of pine wood. Pitch has many industrial applications, and is used in manufacturing varnishes, fuel, roofing paper, preservative coatings, and street paving, and for calking seams. G.M.S.

Related Subjects. The reader is referred in these volumes to the following articles:

Asphalt Coal Tar Tar Turpentine

PITCHBLENDE, *pich' blend*, a brown to black or greenish massive mineral which has become commercially important as a source of radium. The name refers to its pitchlike luster. Radium is found in all ores containing uranium, and pitchblende is the most important of these ores. Its composition varies, but it always contains uranium in combination with oxygen, associated with oxides of other metals. Radium was first extracted from pitchblende obtained in Bohemia (now Czechoslovakia), but the richest deposits known to-day are found in the Belgian Congo. Other sources include Saxony, Hungary, Norway, Sweden, Cornwall (England), Ontario, and several states of the Union, principally in Connecticut, Texas, and North Carolina. Polonium and actinium are other radioactive elements which have been extracted from pitchblende. See RADIUM; URANIUM. A N.W.

PITCHER, MOLLY, a heroine of the Battle of Monmouth in the Revolutionary War. She was the daughter of John George Ludwig of Carlisle, Pa., and was named Mary; she gained the name by which she is now known by her services during the war. When her first husband, John Hayes, enlisted in the First Pennsylvania Artillery, she determined to accompany him and to do whatever she could to serve her country. It became her regular duty to carry water to the soldiers in the heat and dust of battle; and because she carried it in a pitcher instead of a pail, she became known as "Molly Pitcher."

At the Battle of Monmouth, her husband was shot while attending his gun. She promptly took his place and kept the gun in action during the remainder of the battle. For this deed she was presented with a sergeant's commission by General Washington, and later she was given a pension by the state legislature of Pennsylvania.

In 1876 the citizens of Cumberland County erected a monument to her memory at Carlisle, inscribed to "Molly McCauley, Renowned in History as Molly Pitcher, the Heroine of Monmouth." See illustration, page 5631.

Accounts of the activities of this semi-historical person vary in detail, and since the sources of her history are meager, it is impossible to separate fact from legend in a story so romantic.

PITCHER PLANTS, a family of plants having pitcher-shaped leaves that form traps for insects, which are digested and absorbed as food. This method of obtaining nourishment places the pitcher plants in the group known as *carnivorous plants* (which see). The *common northern pitcher plant*, which grows in bogs and swamps east of the Rocky Mountains and from Labrador south to Florida, is a typical species (see BOTANY). The pitcher shape results from a peculiar folding together



Photo· Visual Education Service

PITCHER PLANT

of the leaf margins, permitting rain water to collect in the receptacles. At the mouth of each pitcher is a thick growth of bristly hairs, all pointed downward and inward, and when insects, attracted by a sweet secretion within the rim, fly into the trap, they are unable to turn back, because of the hairs, and so are drowned.

The pitcher plant has several local names, such as *side-saddle flower*, *huntsman's cup*, and *Indian dipper*. Its flowers grow singly on long, slender stems, and are deep reddish-purple in color, and globe-shaped.

In the Southern states is found a yellow-flowered species with tall, erect, trumpet-shaped leaves. Another species, native to California, has a pitcher with the top shaped like a hood. While most insects captured by this plant are killed and digested, a certain moth has learned to make its home in the receptacle. Pitcher plants are becoming very scarce because their interesting habits are an irresistible temptation to gatherers of wild flowers. B.M.D.



Photo: Brown Bros.

Molly Pitcher at the Battle of Monmouth. Here is an artist's conception of the scene when the heroic woman won a sergeant's commission and an imperishable place in her country's history. See article, page 5630.

Scientific Names. The pitcher plants form the family *Sarraceniaceae*. The northern species is *Sarracenia purpurea*; the southern, *S. flava*; the California, *Darlingtonia californica*.

PITCH LAKE, the most remarkable of the world's deposits of asphalt. See ASPHALT; TRINIDAD.

PITMAN, BENN, originator of a system of shorthand. See SHORTHAND WRITING; PITMAN, SIR ISAAC.

PITMAN, SIR ISAAC (1813-1897), an English educator who was knighted by Queen Victoria for his invention of the system of shorthand writing which is known by his name. He was born at Trowbridge, in Wiltshire.

After 1843 he devoted himself entirely to developing his system of phonography, or shorthand, which was first given to the public in 1837 in his *Stenographic Sound-Hand*. This was not the first shorthand method invented, but it was so much superior to all that had preceded it that it practically superseded earlier efforts. From 1842 until his death, Pitman published the weekly *Phonetic Journal*, and he took a keen interest in spelling reform, publishing several pamphlets on that subject. Competing for a prize offered by the English government for the best method of collecting prepaid postage on letters, Pitman suggested stamps, which are now used everywhere, and thereby won the award.



Photo: Brown Bros.

ISAAC PITMAN

There are two systems of Pitman shorthand writing—that by Isaac Pitman, and a later adaptation by Benn Pitman, younger brother of Isaac, who came to America and popularized his work in the United States. The system of Isaac Pitman is most used in England. The main difference is the reversal of the order of position of the vowel sounds. See SHORTHAND WRITING.

PITT, the family name of two English statesmen, father and son, both of whom achieved distinction.

William Pitt, first Earl of Chatham (1708-1778), was known before his elevation to the peerage as the GREAT COMMONER. He was born at Westminster and was educated at Eton and at Trinity College, Oxford, but owing to ill health, did not take a degree. In 1731 he entered the army, but four years later relinquished a military career and became a member of Parliament from Old Sarum, the family borough. Almost immediately he became a noteworthy figure in the House of Commons, and Robert Walpole found in him one of his sharpest critics. One speech in particular which was credited to him became famous and has always held a place in collections of declamations—the one beginning:

The atrocious crime of being a young man, which the honorable gentleman has with such spirit and decency charged upon me . . .

This speech, however, was reported on hearsay by Dr. Johnson, and doubtless contains more mannerisms of the latter than of Pitt. His determined opposition to Walpole brought him a reward when he least expected it; the Duchess of Marlborough, dying in 1744, left him a legacy of £10,000, or $50,000.



WILLIAM PITT
First Earl of Chatham.

The Empire Builder. In 1746 Pitt received his first office, that of Vice-Treasurer of Ireland, and later in the same year was made Paymaster-General, with a seat in the Privy Council. By his refusal to accept in this position the special emoluments which previous holders of the office had taken without question, Pitt won for himself the complete confidence of the people, and so advanced his career. Dismissed from office in 1755 because of his outspoken criticism of the Ministry's war policy, Pitt was made Secretary of State and leader of the House of Commons in 1756. Here again he failed to hold the regard of the king, and was forced to resign within a year, but the nation spoke its feelings so strongly that the king was compelled to recall him at once.

As virtual head of the government, of which the Duke of Newcastle was the nominal head, Pitt turned his attention to making England a great power among the nations, and much of the praise for campaigns which overthrew France and won for England glory in America and in India belongs to him. Indeed, it is not too much to say that it was he who began to build the Empire of Great Britain.

A Friend of America. When George III came to the throne in 1760, Pitt's fortune began to change, for the new king had no love for the great Minister. In 1761, therefore, Pitt resigned, and remained for five years out of office, though he still exerted a powerful influence in public affairs. Especially did he oppose the imposition of taxes on the American colonies; this policy made him very popular in the subject country. In 1766 he was called upon to form a new Cabinet, and was at the same time created Earl of Chatham. His acceptance of the peerage lessened his popularity, and his health was so poor that he was able to take only a subordinate part in the work of the Ministry; he did not oppose the tea tax of 1767, to which he was opposed in principle.

In 1768 he resigned and never afterward held office, though he still took a keen interest in public affairs and did not cease to oppose in the House of Lords the government's policy toward America.

Estimate of His Career. Pitt holds a place in English history not only as one of the greatest, perhaps the very greatest, of the country's war Minis-

ters, but as the first successful public man who depended for his support, not on king or Parliament, but on the nation as a whole.

In America Pitt was recognized as the colonies' stanchest friend in the home government, and when Fort Duquesne was rebuilt, it was named in his honor Fort Pitt; this later became Pittsburgh.

William Pitt (1759-1806), the younger son of the above, is considered by many historians to be the greatest Prime Minister England has ever had. He was born at Hayes, near Bromley, in Kent, and entered Pembroke Hall, Cambridge, when but fourteen years of age Of delicate health and somewhat austere manner, he made no friends at the university and took no part in its social life, but he displayed a maturity and a capacity for learning which amazed his teachers. After his graduation, in 1780, he studied law and was admitted to the bar, but never practiced, for he began his Parliamentary career the following year. His very first speech attracted favorable attention; it was not unworthy of the man who later took rank as the superior of Edmund Burke and the equal of Charles Fox.



Photo: Brown Bros.

WILLIAM PITT

A Youthful Premier. The first minor official position offered him Pitt declined, because nothing less than a Cabinet office could satisfy him; in 1782 he became Chancellor of the Exchequer in Lord Shelburne's Ministry. Meanwhile, he had shown his interest in Parliamentary reform by introducing a bill in Parliament which was defeated by but a few votes. This interest was unabated until the stormy days of the French Revolution compelled him to abandon his efforts. After the Shelburne Ministry and the succeeding coalition government had been defeated, Pitt became Premier in December, 1783, when not twenty-five years of age He had come to office at a difficult time, for the majority in the House of Commons was against him, and it was felt that he would soon be forced to resign; but he persisted until by his oratory and evident sincerity of purpose he had won popular favor, and then, early in 1784, he appealed to the country The general election gave him a large majority, and, save for the interval between 1801 and 1804, he ruled England till the close of his life.

What He Sought to Accomplish. His first problems were financial, and these he met most successfully by many wise measures. He reformed the administration of the East India Company, abolished scores of well-paid but useless offices, and in 1786 established a sinking fund for the reduction of the national debt. He also attempted to provide for free trade with Ireland and to put through a reform bill, but in these efforts was defeated.

His heart was in these economic measures, for he was preëminently a peace Minister, but he was forced to become a war Minister during a very troubled period of his country's history. As long as possible he refrained from interfering in the affairs of France, but in February, 1793, the latter country declared war against England. In the conflict which followed. Pitt's policy had two aims—to defeat France on land and to destroy its power on the sea. Chiefly through the genius of Lord Nelson, the latter object was accomplished, but the English army was weak and the war on land had to be conducted by allied nations which were aided by large English subsidies. These allies frequently failed to carry out Pitt's plans.

His Second Ministry. In 1800 Pitt brought about the Parliamentary union of Ireland and England, but to Roman Catholic emancipation, which he had intended to couple with the measure for union, King George III obstinately refused to give his consent. Pitt therefore resigned in 1801, and was succeeded by Addington, whom he supported as long as he conscientiously could The war with France, brought to a close for a time by the Peace of Amiens, was reopened in 1803, and in the next year Pitt was again asked to take charge of the government. He formed a coalition with Russia and Austria against France, but the two allies were defeated at Austerlitz in December, 1805, and Pitt, already worn with the struggle, did not long survive the disaster. He realized fully the ambition and the powers of Napoleon, and what they would mean to Europe, and exclaimed shortly before he died "Roll up the map of Europe; it will not be wanted these ten years."

His Character Pitt lacked the warm-hearted, sympathetic qualities which distinguished his great rival, Fox, and showed in all his acts a pride and aloofness which frequently made him disliked. But this very pride was the sign of uprightness which won him the trust of king, Parliament, and people.

Related Subjects. The wars referred to above in 1755 were known in Europe as the *Succession Wars*, and in America as the *French and Indian Wars*. Both series are described in these volumes under their proper headings See, also, FORT DUQUESNE, WALPOLE, ROBERT.

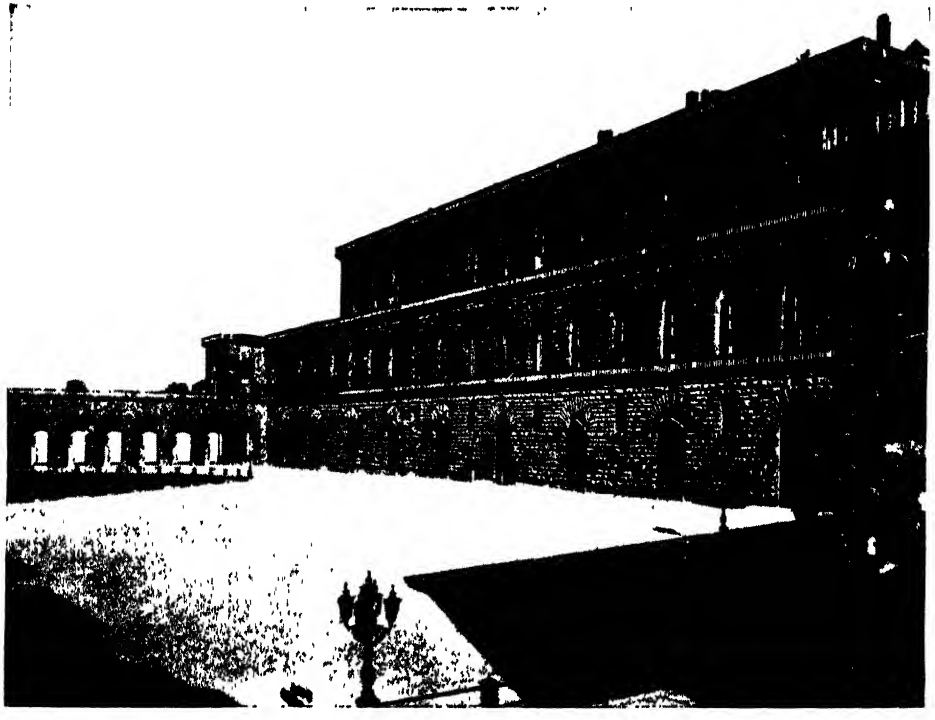
In addition to references above, see GREAT BRITAIN (History), relating to this period.

PITTACUS. See SEVEN WISE MEN OF GREECE.

PITT DIAMOND. See DIAMOND.

PITTI PALACE, a famous royal palace at Florence, Italy, begun in 1440 after designs by Brunelleschi. He died when only the first story had been built, and the remaining two stories were not added until over a century later. The original designs had been lost, and new ones were made, but despite this change of plan, the building ranks as one of the most imposing palaces in the world. Next to the Vatican, it is the largest palace in Italy, and its situation, on the left bank of the Arno River, adds to its effectiveness.

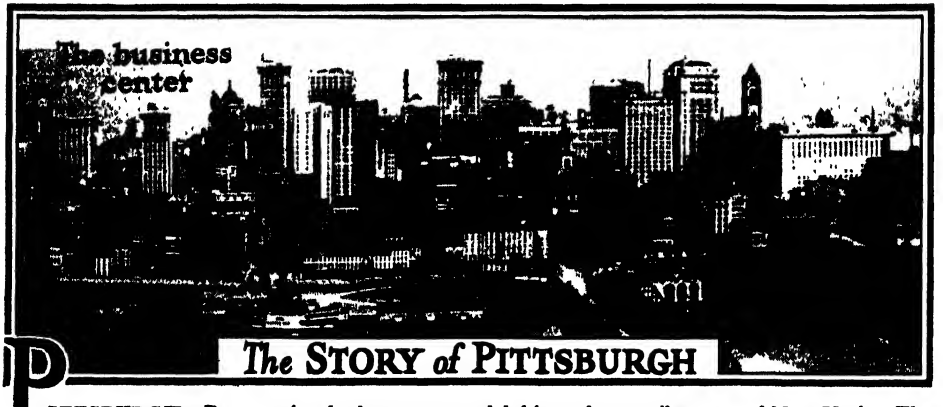
Originally built for the Pitti family, whose head was chief magistrate of the republic of Florence, it became in the sixteenth century the property of the grand dukes of Florence, and to-day is one of the residences of the king of Italy. A new vestibule and stairway, quite in keeping with the rest of the building, were added in the latter part of the nineteenth century. The Pitti Palace is noteworthy for its collection of paintings, one of the finest in the world, containing works by Raphael, Titian, Andrea del Sarto, Dürer, Rubens, Rembrandt,



PITTI PALACE
It is connected with the Uffizi Gallery (over the Arno River) by a covered passageway.

and others. The gallery is open to the public. See FLORENCE (Italy).

PITTSBURG, KAN. See KANSAS (back of map).



The STORY of PITTSBURGH

PITTSBURGH, PA., variously known as "the Gateway of the West," "the Iron City," "the City of Steel," "the Hearth of the World," and "the Smoky City," ranks next to Philadelphia in population and in manufactures in the state. It is the county seat of Allegheny County. The city is situated in the southwestern part of Pennsylvania, where the Monongahela and Allegheny rivers unite to form the Ohio River, about 340 miles west of Philadelphia and 430 miles west of New York. The center of the largest and most productive coal fields on the North American continent and of a highly productive oil field, tapping one of the richest gas fields in the world, with 250 miles of navigable-river frontage and much of beauty in its hills—these are some of nature's gifts that have provided the foundation on which Pittsburgh has grown from a solitary frontier outpost in colonial times to a manufacturing

metropolis of front rank. On July 1, 1928, the city's population, according to Federal estimate, was 673,800. In November, 1928, a popular election authorized the creation of a Metropolitan Pittsburgh, to include the entire County of Allegheny. The greater city has a population of about 1,500,000.

General Description. The land area within the city limits is 49.1 square miles. The original Pittsburgh lies in the "Point" formed by the meeting of the Monongahela and Allegheny rivers. This constitutes its administrative center, the manufacturing and industrial interests occupying the water front farther upstream. The business section is hemmed in on the east by hills, and on the other sides by water. The most attractive residential places are the hilly East End, South Hills, and the North Side. These sections are on hills overlooking the Allegheny from the north and the Monongahela from the south. The highest point in the city is Herron Hill, about 1,200 feet above sea level.

The Monongahela River, from the southeast, is joined by the Allegheny, from the northeast, and the Ohio River, formed by their union, flows in a northwesterly direction to the city limits. West of the Allegheny and north of the Ohio is a section which constituted the city of Allegheny, which was annexed to Pittsburgh in 1909. What is known as the Pittsburgh Metropolitan District includes Homestead, McKeesport, Bloomfield, Wilkinsburg, Braddock, and more than fifty other boroughs, all intimately associated commercially and socially with the greater city.

Because of its extremely hilly site, Pittsburgh has more bridges and viaducts than any other city in the world; of these there are more than 100 within the city proper. Spanning a deep valley between Herron Hill and the Bloomfield district is the Bloomfield Bridge, almost a mile long. The Larimer Avenue Viaduct, having a span of 312 feet, is one of the largest single-arch concrete bridges ever constructed. Other bridges are the concrete Meadow Street and Atherton Street bridges, and the North Side Point Bridge. There are many inclined railways which carry passengers and freight to higher levels. The Mount Washington incline lifts passengers 400 feet above the level of the old city to newer portions on the heights. Tunnels leading to the South Hills residential section make this district more accessible. When the ship canal between Lake Erie and the Ohio River (127½ miles), just below Pittsburgh, is completed, it will make Pittsburgh an inland-lake as well as a river port.

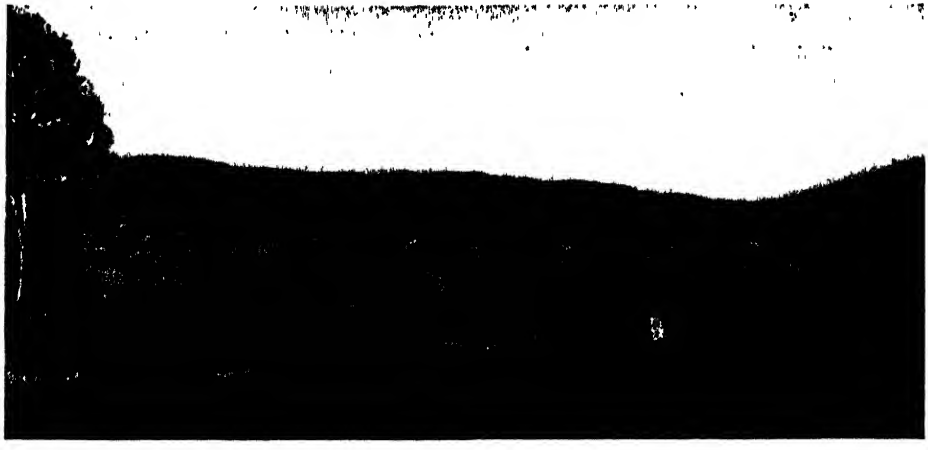
Docks, warehouses, tenements, and manufacturing plants are crowded into the Point near the river, wherever low, suitable sites are found. Along the river banks for more than twenty miles are situated the immense rolling mills, blast furnaces, foundries, and various other manufacturing plants of the Pittsburgh District. In the early days, these plants, using soft coal, caused much smoke, and consequently the city was nicknamed "the Smoky City," but the efforts of a bureau of smoke regulation in the city department of health have materially reduced the smoke nuisance. Back of the manufacturing center is the business section, containing many fine office buildings of the skyscraper type, banks, and wholesale and retail houses.

Streets and Buildings. Although narrow streets are still to be found in the older sections, in the newer and larger districts Pittsburgh presents a very modern appearance. At a cost of several million dollars, many of the streets in the downtown district leading from the Point were widened. Various streets were raised from one to fifteen feet as a precaution against floods. In 1926 there were 612 miles of paved streets in the city limits.

Programs for city development include extensive bridge-building, highway and boulevard construction, street-widening, wharf improvements to cope with the growth of river traffic, a municipal airport, provisions for new city and county parks, and a Town Hall. Toward the end of 1928, ground was broken for Pittsburgh's new $40,000,000 power plant. Among Pittsburgh's leading thoroughfares are Fifth and Sixth avenues, Wood, Federal, Market, Diamond, and Smithfield streets, Boulevard of the Allies, and Bigelow Boulevard Fourth Avenue is the city's Wall Street, and on Penn, lower Liberty, and Smithfield are located the leading retail stores.

Buildings of note include the City-County Building, erected at a cost of $3,500,000; Allegheny Court House and jail, occupying two separate blocks and connected by a "bridge of sighs"; the First National Bank Building, Memorial Hall, and the Frick, Plaza, Clark, Grant, Oliver, Carnegie, Chamber of Commerce, Masonic Temple, and United States Arsenal buildings.

Institutions. Foremost among the public institutions are the Carnegie Library and the Carnegie Institute, in Schenley Park, which were established by a gift of Andrew Carnegie, representing endowments of $25,000,000. The Institute consists of an Institute of Technology, the Gallery of Fine Arts, and the Museum of Science, both of the latter being housed in the Central Library building. The Carnegie Free Library of Allegheny is a separate foundation, which has an annual appropriation from Pittsburgh. The Mellon Institute for Industrial Research was founded by Andrew W. Mellon, later Secretary of the United States Treasury. Henry C. Frick, who beautified the city by two monumental office buildings, bequeathed a large natural woodland for a park and made



THE TOWN OF PITTSBURGH IN 1817

large monetary gifts to the city's philanthropic institutions. The Pittsburgh zoo and the Elizabeth Steel Magee maternity hospital were given by Christopher L. Magee.

For higher education the city has the University of Pittsburgh, formerly the Western University of Pennsylvania, founded in 1787. This university raised $7,000,000 toward the erection of the fifty-two-story Cathedral of Learning, and in 1923 added thirty-two acres to the campus [see PENNSYLVANIA (Education)]. Other noted educational institutions are the Pennsylvania College for Women; Duquesne University, formerly the College of the Holy Ghost (Roman Catholic); the theological seminaries of the Presbyterian, United Presbyterian, and Reformed Presbyterian churches; and Pittsburgh, East Liberty, and Shadyside academies.

Parks and Boulevards. All efforts to beautify the city are concentrated in the residential sections and in the suburbs, since little can be done in the manufacturing districts along the river. Schenley Park comprises more than 400 acres and is one of the most beautiful parks in the United States. It was the gift of Mrs. Mary E. Schenley, of London, England, a native of Pittsburgh. The park contains the Phipps Conservatory and the Hall of Botany, the gifts of Henry Phipps; the Carnegie Institute and Library, a music pavilion, a race track, several fine bridges, and statues of E. M. Bigelow, Colonel Alexander L. Hawkins, a hero of the Spanish-American War, and Robert Burns. Its flower conservatories are among the largest in the United States.

Picturesque Highland Park, overlooking the Allegheny River, which comprises more than 360 acres, has an attractive entrance and contains a zoölogical garden, three shelter houses, and fine statues, of which the most notable is that of Stephen Collins Foster. These two parks, which are the largest in the city, are connected by boulevards.

There are many smaller recreation grounds, of which Riverview, Herron Hill, McKinley, Lawrence, Grandview, and West End parks are the most notable; altogether, these recreation grounds cover more than 1,300 acres. Thomas Boulevard, Morewood, Ellsworth, North Highland, and Amberson avenues, and the eastern parts of Fifth and Penn avenues, are some of the more exclusive residential districts, and costly residences may be seen in Squirrel Hill, Shadyside, Homewood, Bellefield, and East Liberty districts. South Hills and Schenley Farms have been recently opened as residential sections.

Transportation. Through the dense mass of buildings along the rivers is woven a network of railroads; and the rivers, made navigable by dams, seem to be moving streams of coal, iron ore, and various kinds of somber-looking freight.

The prosperity of Pittsburgh is due to its location near large and productive fields of coal, petroleum, and natural gas. Access to the vast coal fields of West Virginia is had through the Monongahela River, and to the coal and oil fields of Western Pennsylvania through the Allegheny River, while the Ohio River affords commercial relations with important points on 2,500 miles of waterways. The transportation facilities of these rivers are greatly increased by the service of a number of railroads, by which the city has connection with all parts of the country. Among these are the Pennsylvania, the Baltimore & Ohio, the Buffalo, Rochester & Pittsburgh, the Pittsburgh & Lake Erie, and the Bessemer & Lake Erie. Interurban electric lines radiate from the city in all directions.

Industry. The abundance of cheap fuel has attracted to the locality those great industries

which need fire for their operation. The Pittsburgh district is not only the greatest coal-producing (bituminous), but the largest coal-consuming, center in the country; natural gas, which formerly gave impetus to manufactures, is now used chiefly for domestic purposes. Some of the largest blast furnaces in the world and the most extensive plants for making steel rails, armor plate for battleships, and structural work for steel bridges are located here. Pittsburgh might well be called the *hearth of the nation*; these immense furnaces, factories, and foundries that produce so much smoke also send up great tongues of flame which illuminate the sky by night, and make the locality visible for many miles.

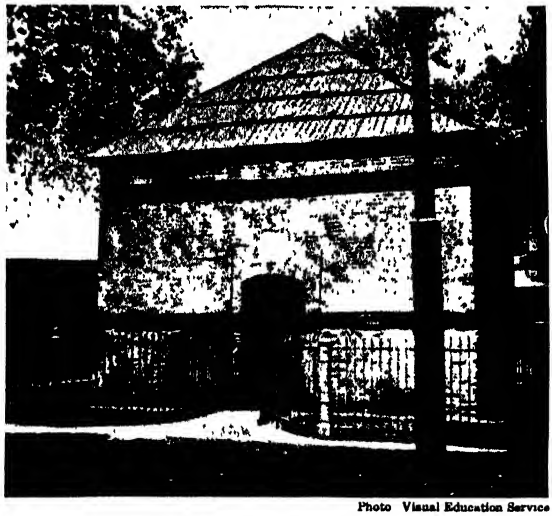


Photo Visual Education Service

THE OLD BLOCKHOUSE

Greater Pittsburgh's steel works and rolling mills exceed those of any other like area in the United States in capacity and in production and total value of product. The city is the headquarters of the United States Steel Corporation. It has been estimated that Greater Pittsburgh's steel works and rolling mills annually produce 11,500,000 tons of steel ingots and castings, which is about twenty-five per cent of the nation's output and fifteen per cent of that produced in the world. Under normal conditions, it furnishes forty per cent of the coal mined in the United States. Twenty per cent of the world's coke is produced within one hundred miles of the city. The 4,500 oil wells annually produce 1,500,000 barrels of Pennsylvania oil; and the refineries produce annually more than 12,000 tank cars of refinery products, having a value of about $25,000,000. The production of pig iron is one-fifth of that of the United States and one-tenth that of the world, having an estimated value of $200,000,000 annually.

Greater Pittsburgh's contribution to the glass output of the United States comprises one-fifth of the plate glass, one-fifth of the window glass, one-sixth of the tableware, and one-sixth of the bottles and jars. It manufactures more than $110,000,000 worth of foodstuffs annually. Of this total, pickling and preserving products are valued at $23,000,000; meat and packing, $30,000,000; and bread and bakery products, $35,000,000. Other important industries include printing and publishing and the manufacture of tobacco, pipe, cordage, paint and varnishes, electrical machinery, and brass and bronze products.

History. George Washington visited the present site of Pittsburgh in 1753, and advised the erection of a fort there, as the place had command of the rivers. Accordingly, a fort, or blockhouse, was begun at the "Forks" in the February of the following year, but the detachment of militia sent to occupy it was forced by the French and Indians to abandon the post. The building of Fort Duquesne by the French followed; it was taken by the English under General Forbes in 1758. At the suggestion of General Washington, its name was changed to Fort Pitt, in honor of William Pitt, the British Prime Minister. [The original spelling, Pittsburg, was continued until 1911, when the final *h* was added.] The fort was conspicuous during the Revolutionary and French and Indian wars; the only remnant of the extensive fortifications is the *Blockhouse*, built by Colonel Henry Bouquet in 1763, and now owned by the Daughters of the American Revolution. The town was organized in 1764, and the borough was incorporated in 1794.

In 1811 the first steamboat on the Western rivers was launched at Pittsburgh, and in 1816 the borough became a city. In 1797 the glass industry was established. Impetus was given the growth of the city by the opening of the Pennsylvania Canal to this point in 1834, but in 1845 a heavy loss by fire was sustained. In 1851 the first railroad entered the city. During the first great railroad strike in America (1877), the militia at Pittsburgh refused to fire at the strikers, and state troops, with some loss of life, restored order.

During the World War, the city's vast mills were transformed into ordnance and ammunition factories, and the district was called "the Arsenal of the World," as the Pittsburgh zone of the War Resources Board supplied fifty per cent of the iron and steel used for the manufacture of munitions for the war.

The modern development of Pittsburgh dates from the year 1909, when the city of

Allegheny was annexed, giving the consolidated municipality a population exceeding a half million people. A new public-school system was introduced, and the ward representation in the legislative branch of the city government was superseded by a council of nine members elected by the people at large. These political reforms were followed by the adoption of a comprehensive plan for public improvements, unifying its civic enterprises and uniting its suburban districts under a plan for a compact metropolitan area. H.W.C.

PITTSBURGH, UNIVERSITY OF. See PENNSYLVANIA (Education).

PITTSBURGH OF THE SOUTH. See ALABAMA (Manufactures).

PITTSBURG LANDING, BATTLE OF. See WAR OF SECESSION.

PITTSFIELD, MASS., the county seat of Berkshire County, is situated in the heart of the Berkshire Hills, in the northwestern part of the state. It is on a branch of the Housatonic River, 150 miles west of Boston. The city lies 1,037 feet above the sea in a region of beautiful hills, valleys, and lakes, constituting a favorite residence and vacation section.

Pittsfield was settled in 1743 as Pontoosuck, or Boston Plantation. When it was incorporated, in 1761, the present name was adopted. It became a city in 1891. Population, 1928, 50,000 (Federal estimate).

Transportation. Pittsfield is served by the main line of the Boston & Albany, the Harlem division of the New York Central, and the Berkshire division of the New York, New Haven & Hartford It is the center of a fine system of motor highways

Industries. Pittsfield is noted for its manufacture of the paper on which all government money and bonds are printed Other manufactures include fine stationery, textiles, and spool silks. A large General Electric plant is located here.

Institutions. Prominent features of the city are Miss Hall's School for young women, the Berkshire Athenaeum and Public Library, the Crane Museum of Natural History and Art, a Soldiers' and Sailors' Memorial, a state armory, House of Mercy, Hillcrest and the tuberculosis hospitals, the Henry W Bishop Training School for Nurses, and the Berkshire County Home for Aged Women. C. OF C.

PITTSTON, PA. See PENNSYLVANIA (back of map).

PITUITARY, *pih tu' ih ta rie,* **GLAND.** See ZOÖLOGY (How Zoölogy Affects Human Welfare); GLANDS (Ductless Glands).

PIUS, *pi' us,* the name of eleven Popes, nearly all of whom won a permanent place in history. Three of them lived within the memory of millions of the world's present population, a fact unusual in the history of the Papal succession.

Pius II, Pope from 1458 to 1464, was known before his accession as AENEAS SYLVIUS. He was born in 1405 of a noble family. His unusual ability was evident in his youth, and he was employed in several important posts while still a young man. Especially at the Council of Basel, in 1431, did he show his powers, succeeding by his reasoning and his oratory in reconciling the Emperor Frederick III and the Papacy. He decided to take holy orders in 1445, and in 1456 he received a cardinal's hat. After his election to the Papal chair, in 1458, Pius attempted to organize a crusade against the Turks, but found the old holy enthusiasm hard to rouse He persisted in his efforts, and at last actually assembled a force, of which he was to be the head, but he died before the expedition could set sail.

He was a literary man of eminence, and one of the most learned scholars of his day. His best writings include collections of letters, autobiographical commentaries which are important for details of the history of his time.

Pius IV, Pope from 1559 to 1565, was born in 1499 of an obscure family in Milan. He was named GIOVANNI ANGELO MEDICI, though his people were not related to the famous Medici of Florence In his young manhood he was a lawyer, and as such was employed on several important diplomatic commissions, but later entered the Church, becoming archbishop in 1545 and cardinal in 1549 Early in 1562 he reassembled the famous Council of Trent, which continued its sessions until December, 1563, and at its close published, as an embodiment of the doctrines defined by it, the Creed of Pius IV, which must be accepted by all taking orders in the Roman Catholic Church, and by all converts Pius IV was more conciliatory in his attitude toward the Protestants than his predecessors had been.

Pius V, Pope from 1566 to 1572, was born in 1504, in Lombardy His lay name was MICHELE GHISLIERE He entered the Dominican Order in his fifteenth year, distinguishing himself by the severity of his life and his asceticism In 1557 he was made a cardinal, and in the following year he became grand inquisitor for the Roman Catholic world In 1566 he succeeded Pius IV He was zealous for reform, and promoted in every possible way the Counter-Reformation.

Elizabeth of England was excommunicated by him, and Charles IX of France was encouraged in his measures against the Huguenots Most important of all his achievements was the formation of the Holy League against the Turks, in which the States of the Church were joined by Spain and Venice It was this league which so thoroughly defeated the Turks in the Battle of Lepanto; in 1571. Pius V was the last Pope to be canonized.

Pius VI, whose secular name was GIOVANNI ANGELO BRASCHI, was born in 1717 He received the degree of doctor of laws and entered ecclesiastical life at an early age He was elected to the Papal chair in 1775, having been made a cardinal two years earlier. The early part of his reign was taken up with disputes with the Emperor Joseph II, who had declared that all the religious orders within the empire were independent of Papal control. More serious disturbances came later, however, after the outbreak of the French Revolution. During his invasion of Italy in 1797, Napoleon Bonaparte forced from the Pope, who had favored the allies, a treaty giving up certain territory; and in the next year the French entered Rome, proclaimed a republic, and took bodily possession of the Pope when he refused to renounce his temporal authority. He was carried to Siena, to Grenoble, and later to Valence, where he died in 1799. See BONAPARTE, NAPOLEON.

Pius VII, formerly GREGORIO LUIGI BARNABA CHIARAMONI, was one of the most important Popes who ever bore this name. He was born at Cesena in 1742, became a Benedictine monk, and rose rapidly in the Church until, in 1785, he was created a cardinal. In 1800 he was elected to the Papacy and was allowed to enter Rome, although the city was in the hands of the French. The French troops were soon withdrawn, and only legations remained. As Napoleon was desirous of restoring religion to its former place in France, an agreement was concluded, and in 1804 the Pope went to Paris and crowned Napoleon emperor. The friendly relations between the two had already been somewhat strained, and after this time they became more so, until, in 1809, Napoleon declared the States of the Church annexed to French territory. The Pope at once issued a bull of excommunication against the perpetrators of these outrages against the territory of the Holy See, not, however, mentioning Napoleon's name, and was in consequence arrested and taken to Savona and afterward to Fontainebleau. After Napoleon's downfall, Pius returned to Rome, and the Congress of Vienna restored to him all the former territories of the Church During the quiet remainder of his reign, he showed himself active in opposition to secret societies and in the reestablishment of the Jesuits He died August 20, 1823.

Pius IX was in the Papal chair at the time of the formation of the kingdom of Italy, and was thus the last of the Popes, for nearly sixty years, to wield temporal power His original name was COUNT GIOVANNI MARIA MASTAI-FERRETTI He was born at Sinigaglia in 1792, entered the Church in 1819, and by 1827 had risen to the rank of archbishop In 1840 he was made a cardinal, and six years later, on the death of Gregory XVI, was elected Pope. Before his elevation to the Papacy, he had shown liberal tendencies, and his earliest acts as Pope seemed to promise a liberal and popular government, but the events of 1848 were too revolutionary, and in November of that year, he was compelled to flee from Rome, which proclaimed itself a republic. By the aid of the French he was reestablished.

He opposed the attempted union of Italy under Victor Emmanuel, and refused to yield or to make concessions until, in 1870, the French forces which had defended him in his temporal power were withdrawn, and Rome became the capital of united Italy. The Pope persisted in regarding himself as a prisoner, and shut himself up in the Vatican Through these troubled times he had bestowed most of his attention upon Church matters, leaving political questions to his legates. He recalled the Jesuits, established anew the hierarchy in England, and defined, in 1854, the dogma of the Immaculate Conception of the Virgin Mary (that she was created free of taint of original sin).

The Vatican Council, which assembled in December, 1869, was the outstanding event of his pontificate, for it was not only the first Church council since that of Trent, but it promulgated the doctrine of Papal infallibility, thus raising Pius IX to a higher position than any of his predecessors had enjoyed But soon the Italian army occupied Rome; the saddened Pope declared himself a captive of the Vatican, and remained there until his death in February, 1878. See ITALY (History).



Photo Keystone

POPE PIUS XI
Photographed during his daily walk in the garden of the Vatican.

Pius X (1835-1914), born GIUSEPPE SARTO, one of the most notable of recent occupants of the Papal throne, to which he was elected in 1903. His family were humble peasants. He removed the Roman Catholic Church of the United States from the missionary jurisdiction of the Propaganda to an autonomous position, and created two new American cardinals, Farley and O'Connell. Pope Pius died on August 20, 1914, his death having been hastened, it is believed, by grief over the outbreak of the World War.

Pius XI (1857-), the 261st occupant of the Papal chair, was born ACHILLE RATTI, May 31, 1857, of Italian parentage. He was made a priest at twenty-two, and almost at once began to display qualities of mind which marked him for preferment. From his priestly duties he was taken to become Ambrosian librarian at Milan, and was soon transferred to the Vatican Library He served in the latter position many years, leaving it to become Papal nuncio in Poland after the organization of that republic in 1918. In Poland he endeared himself to every class of society by his devotion to the war-torn people, and earned for himself the archbishopric of Milan. He was made a cardinal June 16, 1921, by Benedict XV (see BENEDICT), and therefore had been enjoying that dignity only eight months when, on February 6, 1922, he was elected Pope. From the moment of his elevation to the high office, he evinced a democratic spirit. Pope Pius created two additional American Cardinals—Hayes and Mundelein, in 1924. In the year of the jubilee, 1925, he received more than 1,250,000 pilgrims.

The outstanding event of his pontificate was the reconciliation of the Papacy and the government of Italy, including the restoration of the temporal power of the Popes. For full information, see PAPAL STATES; VATICAN CITY.



FRANCISCO PIZARRO
Drawn from an old painting, now in Madrid.

PIZARRO, *pih zahr' ro*, FRANCISCO (1471-1541), an illegitimate son of a Spaniard, Gonsalvo Pizarro; he rose from obscurity to become a great Spanish explorer, and crowned his life work by conquering Peru. In his early years, he seems to have had little care and no education. A few years after the discovery of the New World, he crossed the Atlantic with Alonzo de Ojeda (1510), with whom he remained several years. Pizarro accompanied Balboa on the expedition which discovered the Pacific Ocean; under another adventurer, in 1519, he received a grant of land in Panama and engaged in cattle-farming there. A few years later, forming a partnership with Diego de Almagro and Father Hernando de Luque, he explored the western coast of South America. Pizarro succeeded in landing on the island of Gallo, in face of native opposition, and Almagro returned north for assistance. The governor of Panama sent an expedition to bring the adventurers home, but Pizarro refused to return, and called for volunteers to assist him in the exploration he had determined to make. Thirteen men remained to share his hardships, and they explored as far as the Bay of Guayaquil, returning with proofs of the richness of the country.

Finding the governor of Panama but little interested in his explorations, Pizarro determined to apply to the Spanish king. Arriving in Spain in 1528, he persuaded Charles V to help him, and on July 25, 1529, at Toledo, the famous agreement was signed making Pizarro governor and captain-general of the province of New Castile for 200 leagues along the coast. In 1530, with a band of followers, including four brothers, he reached Panama, leaving there in

January, 1531, for Peru, and landing at Tumbes. Finding the country weakened by the struggle between Atahualpa, the reigning Inca, and Huascar, his brother, the legitimate monarch, Pizarro seized his opportunity, and, under pretense of supporting the usurper, was allowed to enter the country. Realizing the danger of advancing far with only 100 men, Pizarro attacked the natives and captured Atahualpa; and though the Inca furnished a large ransom, he was killed on the pretense of being discovered in a conspiracy against the visitors. Meanwhile, Almagro returned to his assistance with 150 more followers; the country was then conquered, and Cuzco was occupied by the Spanish. Lima, the first town colonized by Pizarro, was founded in January, 1535.

The king bestowed on the adventurer the title of marquis, and gave Almagro a grant of land. Pizarro began to develop the resources of the country, but in 1536 the Incas attempted to expel the Spaniards, and while defending Cuzco, Juan Pizarro was killed. Then Almagro claimed Cuzco as part of his territory, and seized as prisoners Pizarro's brothers, Hernando and Gonsalvo. The latter escaped, and Pizarro offered to give up Cuzco if his brother Hernando were liberated. This was agreed to, but Pizarro immediately declared war on Almagro, and defeated and captured him; soon the latter was discovered in an attempt to bribe the guards, so he was put to death. Again Pizarro returned to Cuzco, and proceeded to introduce improvements. But the followers of Almagro, supporting the claims of his half-caste son, Almagro the Lad, surprised and mortally wounded Pizarro on June 26, 1541. E.D.F.

Related Subjects. The reader is referred in these volumes to the following articles

Atahualpa	Inca
Balboa	Peru (History)

PLACER, *plas' ur,* **MINES.** See GOLD (How Gold Exists in Nature).

PLAGUE, *playg,* a malignant infectious disease that has been a scourge of humanity since ancient times, taking uncounted millions of lives. The *black death* which devastated parts of Europe in the fourteenth century was plague. In its typical form it is marked by enlargements of the lymphatic glands, called *buboes,* whence has come the name *bubonic plague.* The disease is caused by a microbe, the *Bacillus pestis,* and is usually transmitted to man from rats and other rodents by the bites of fleas. The fact that we have no dreadful plague epidemics sweeping over the world to-day is the result of modern advance in sanitary science and preventive medicine.

An attack usually begins suddenly with chills and fever, followed by headache and pains over the body. Associated with these symptoms is the swelling of the lymph glands, particularly those in the groin, armpit, and neck. Ulceration of the buboes is common. In the pneumonic type of the plague, cough with bloody sputum is a characteristic symptom. There is no specific remedy, but injections of Haffkine's serum have been found useful in conferring limited immunity and lessening the severity of the symptoms. Even with modern methods there is a high death rate.

The first visitation of the plague to Europe occurred at Athens in 430 B.C. One of the most disastrous epidemics of ancient times was that of Rome, in 262, when 5,000 persons succumbed daily. The disease was taken to Europe by the Crusaders in the thirteenth century. From 1334 to 1351, China, India, Persia, Russia, Germany, Italy, France, England, and Norway were devastated by the plague. In succeeding centuries the scourge continued to claim its victims, and between 1603 and 1665, London lost 153,849 souls. One visitation of the disease is graphically described by Defoe in his *Journal of the Plague Year.* In Marseilles, in 1720, 60,000 succumbed in seven months, and Moscow was almost depopulated in 1771. Africa and Asia suffered no less than twenty-three epidemics between 1783 and 1844. Constantinople lost 260,000 of its inhabitants in two epidemics (1803 and 1813).

Sanitary precautions in regard to drainage, campaigns against rats, and strict quarantine regulations have brought the disease under control in enlightened countries, but there are always some cases in every continent except Australia, and severe epidemics still occur in Asia and Africa. According to international agreement, news of the occurrence of the plague in any port is given world-wide publicity. The disease entered New York from South America in 1899, and entered San Francisco from Honolulu in 1900; it has also appeared in New Orleans and Seattle. It is the effective work of the United States Public Health Service in regard to quarantine and sanitation that has kept the disease from menacing the American people. W.A.E.

PLAIN, *playn,* a broad, level expanse of land generally rising not more than 1,000 feet above the sea. There is often no line of separation between a plain and a plateau; this is illustrated by the great central plain of North America, where the ground gradually slopes up from the Mississippi River to an altitude of 2,000 feet before it joins the plateau upon which the Rocky Mountains rise. Within the United States the great plain is treeless for 500 miles east of the mountains, on account of the dry climate, but in the same comparative location in Canada, where there is more rainfall, large forests cover parts of the land. Much of the surface of the plains is covered with a more or less abundant growth of herbage, on which herds of countless buffaloes once fed. Most inland plains have a rich soil capable of



Photo Visual Education Service

VIEW OF A NARROW FLOOD PLAIN
The scene is on the Kentucky River, near the city of Frankfort.

producing abundant crops in favorable weather, and transportation is also a simple problem on the level country; such regions are therefore generally well populated.

Coastal Plain. This is a stretch of lowland extending along a seacoast, and sloping gently toward the adjacent floor of the sea, of which it is a continuation. Such a plain represents what in many cases was formerly the bed of the sea, and is composed of material washed down from the mountains by rivers. This material, by a gradual process of accumulation, builds up a plain on the sea floor which may be uplifted to become a part of the land area of the continent. Rivers cut channels in its surface, for coastal plains are exposed to the same processes of erosion as mountains and plateaus. Because of the comparatively level surface, nearness to the sea, fertile soil, and navigable rivers, coastal plains usually become prosperous centers of population. Among well-developed coastal plains of the world are those of Eastern North America, the east coast of India along the Bay of Bengal, the coastal slope of Guiana, and the plains of Argentina, east of the Andes Mountains.

The Atlantic coastal plain is one of the best examples of this type of plain. It lies along the eastern shore of the North American continent from Canada to Mexico, bordering on the Atlantic Ocean and the Gulf of Mexico. From New York to Georgia it occupies a narrow strip of land between the Atlantic on the east and the foothills of the Appalachian Mountains on the west; below Georgia it broadens out to include Florida. Passing around the southern limits of the Appalachian range in Northern Alabama, it widens out and extends as far north as the Ohio River, while a narrower strip west of the Mississippi River extends southwestward as far as Vera Cruz, Mexico.

The abrupt slope which marks the line along which the older land and the coastal plain merge is known as the Fall Line (which see).

Flood Plain. This is a plain formed of sediment deposited by the overflow of a river. Floods in high regions carry off quantities of earth and other matter, which are deposited lower down in the plains by the flooding of the river valley. The overflowed waters lie practically still on the surface of the land, and a natural deposit occurs. This formation is clearly illustrated along the banks of the Mississippi River, where flood plains covering an area of 50,000 square miles have been formed by the deposits from the often flooded river. In these flood plains, the deposits are so light that the river is constantly washing out new channels.

The nature of the deposit varies greatly, and is governed by the violence of the flood and the nature of the country through which the stream passes. A raging torrent will carry gravel, stones, and even small rocks, while a flood of less violent proportions might carry only light gravel; sluggish waters would contain only fine silt, slowly carried along. A flood plain may be caused by a bank or bar across the river mouth, compelling the river to drop its load, which gradually accumulates until sometimes it forces the river from its

original channel. The Rhine, the Po, and the Ganges are remarkable for their flood plains, but in none of these is the action of the river in forming them so clear as in the Nile. R.H.W.

Related Subjects. The reader is referred in these volumes to the following articles:

Llanos	Plateau	Selvas
Pampas	Prairie	Steppes

PLAINFIELD, N. J. See NEW JERSEY (back of map).

PLAINS OF ABRAHAM. See QUEBEC, BATTLE OF.

PLAINTIFF, *plane' tif.* See COURTS (Court Procedure).

PLANCHETS, *plan' chets.* See MONEY (Where United States Money Is Made).

PLANCK, *plank,* MAX. See QUANTUM THEORY.

PLANCK'S CONSTANT. See QUANTUM THEORY.

PLANE, *playn,* a term used to denote a perfectly flat surface—a surface such that the straight line joining any two of its points lies wholly within the surface. It is also defined as a surface which is determined by any three of its points not in a straight line, by a straight line and a point not in the line, or by two intersecting lines, or by two parallels. When two planes intersect, their intersection is a straight line. A plane has no curvature. A plane figure is one all the points and lines of which are in the same plane. If the lines of a figure are straight, it is said to be *rectilinear*; if they are curved, it is *curvilinear*. Thus a square is a rectilinear and a circle a curvilinear plane figure. J.W.Y.

PLANE, a common abbreviation of airplane. See AIRCRAFT.

PLANET. Among the glories of the heavens are those so-called bright stars that shine with a steady light. Because of constant changing of position among the stars, the ancients called these bodies *planets,* a name meaning *wanderers.* However, by astronomers the planets are not regarded purely as stars. They are bodies which, like the earth, move around the sun in nearly circular paths called *orbits.* Named in the order of their distances from the sun, the planets are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune. Six of them, Mercury, Venus, the earth, Mars, Jupiter, and Saturn, were known to the ancients, but they did not recognize that the earth is a planet. Uranus was discovered by Sir William Herschel in 1781, and Neptune was located by mathematical calculation, in 1846. In March, 1930, a new planet was discovered at a great distance beyond Neptune.

Venus, Mars, Jupiter, and Saturn are easily seen with the naked eye. Mercury is seldom seen because it is so near the sun. Uranus may occasionally be seen by an observer with a keen eye under favorable atmospheric conditions, but in order to see Neptune, one needs a pair of good binoculars or a small telescope.

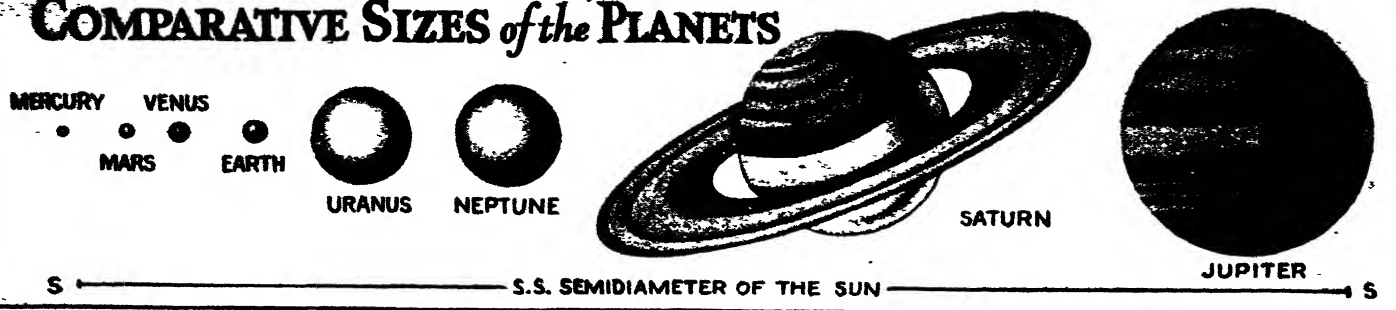
Planets and Stars. Before the invention of the telescope, there was no way known of distinguishing the planets from the stars except by their brighter light. Therefore the ancients called them stars. But we now know that every one can distinguish a planet from a star with the naked eye. A star always twinkles and a planet shines with a steady light (see FIXED STARS). With a small telescope (a good field glass will answer the purpose), another distinction may be seen in the case of the nearer planets. The planet appears as a disk when seen through the glass, but the star as a mere point of light. Mercury and Venus also show phases similar to those of the moon.

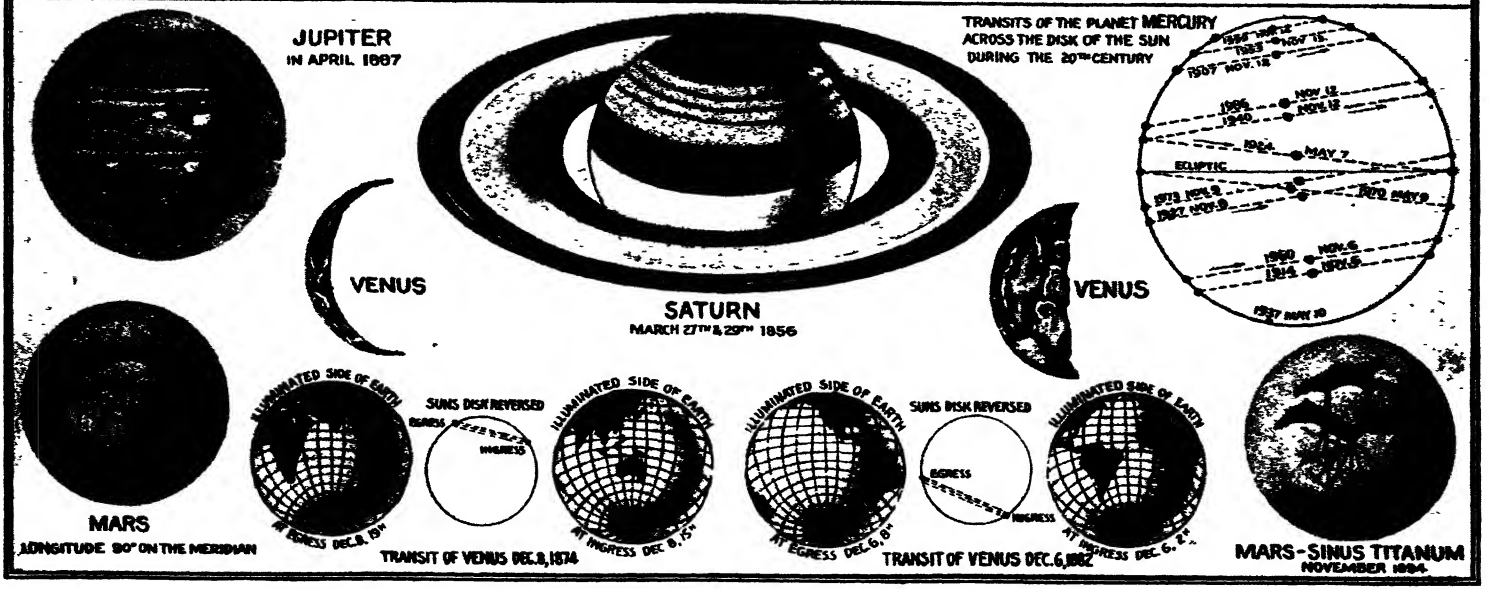
Size and Distances from the Sun. The planets differ widely in respect to size. Mercury, the smallest, is about one-sixteenth the size of the earth, while it would take over 1,300 earths to make a planet as large as Jupiter. Venus is almost as large as the earth; Mars is only one-seventh the size of the earth. Saturn is 730 times larger than the earth, Uranus sixty-four times, and Neptune sixty times larger than the earth. But the amount of matter in a body depends upon both its volume and its density, or mass, and when these factors are considered, we discover some very interesting results. For instance, a person weighing 100 pounds on earth would weigh only thirty-eight pounds on Mars, but if he were to visit Jupiter, his weight would increase to 260 pounds. On Mars he could easily jump over a

NAME	DISTANCE IN ASTRONOMICAL UNITS	YEAR OR PERIOD	DIAMETER
Mercury	0.4	3 months	3100 miles
Venus	0.7	7½ months	7700 "
Earth (basis of measurement)	1 0	1 year	7918 "
Mars	1.5	1 yr. 10 mos.	4200 "
Asteroids	3 0	3 years to 9 years	500 to 10 miles
Jupiter	5.2	11.9 years	86,700 miles
Saturn	9.5	29.5 "	71,500 "
Uranus	19 2	84.0 "	32,000 " ?
Neptune	30.1	164.8 "	31,000 " ?

A new planet, discovered in 1930.

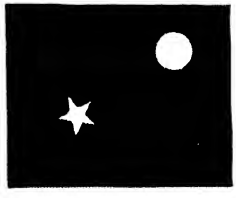
COMPARATIVE SIZES of the PLANETS





ten-foot fence, but on Jupiter it would be an effort for him to jump across a ditch two feet wide. On Mars he could throw a ball three times as far as he could at home, but when he reached Jupiter, he would need a strong arm to throw it a hundred feet. Since everything on the sun would weigh twenty-eight times what it does on the earth, a man weighing 150 pounds would weigh more than two tons when transported to the sun.

The distances of the planets from each other increase with their distances from the sun, as may be seen by making computations from the table on page 5643.



STAR AND PLANET
The difference in appearance of the two, as seen through the telescope

Classification. Humboldt classified the planets into two groups—the *terrestrial* and the *major* groups. The first group includes Mercury, Venus, Earth, and Mars, and was given its name because our planet was one of its members. The group of major planets—Jupiter, Saturn, Uranus, and Neptune—was so named because of their great size. But the density of these large planets is much less than that of the smaller planets, each of which has a density about the same as that of the earth. Were Jupiter's density equal to that of the earth, a man weighing 150 pounds on the earth would weigh 1,500 pounds on Jupiter. Between the terrestrial and major planets is a great space in which are found a large number of small planets called *asteroids*, or *planetoids*.

Another method of classification divides the planets into *inferior* and *superior* groups, the former including planets whose orbits lie between the earth's and the sun, and the latter including those whose orbits lie beyond the earth's.

Movements of the Planets. Every planet has two motions—a revolution around the sun and a rotation on its axis. The time required for a complete revolution in its orbit constitutes the year, or period, of the planet; the time required for its rotation constitutes its day. Because of their smaller orbits, the terrestrial planets have shorter years than those of the major group, but the major planets rotate on their axes more rapidly than the smaller ones. Jupiter's day, for instance, is less than one-half of our day.

The table on page 5643 gives the distance of each planet from the sun, the length of its year, and its diameter, in round numbers. In measuring distance from the sun, the earth's distance is taken as the unit. F.B.L.

Related Subjects. The astronomical difference between a planet and a star is stated in the articles ASTRONOMY and FIXED STARS. For more detailed treatment of various connected subjects, the reader is referred in these volumes to the following articles:

Asteroids	Planetarium
Astronomy	Satellite
Earth	Saturn
Jupiter	Solar System
Mars	Star
Mercury	Sun
Nebular Hypothesis	Uranus
Neptune	Venus

PLANETARIUM, OR **ORRERY,** *or' ur ie,* a representation or model of the solar system. The earlier forms consisted of balls moved by clockwork, to represent the movements of planetary bodies. One of the best of this type was made by Graham and named after the fourth Earl of Orrery, in the early part of the eighteenth century. Other examples, of a later date, were those of David Rittenhouse and Benjamin Franklin, of Philadelphia. These may still be seen by the visitor, in the Franklin Institute in that city.

The modern planetarium is of an entirely different type. It projects images of the heavenly bodies on the interior of a dome, by means of an instrument which operates on the principle of the stereopticon. The stars and planets are points of light instead of balls or globes, as in the older devices.

The idea of the modern planetarium was originated in 1903 by Dr. Oscar von Miller, of Munich, Germany. His purpose was to build "a theater in which the glory of the heavens will be shown as it is in nature, yet one in which astronomy will be stripped of its mysteries." The first mechanism embodying his ideas was constructed by the Zeiss optical works, and installed in the Bavarian National Museum, in Munich, of which Dr. von Miller was director. It may still be seen there, and is a center of interest for thousands of visitors every year. Nearly a score of other similar planetaria have been since built in various cities of Europe.

The first one to be constructed in America is the planetarium built by Max Adler for the people of Chicago. It is located on a small island in Lake Michigan, near the Field Museum of Natural History. It contains all the improvements made in these devices up to the present time, and amply illustrates the movements of the stars and planets, their relative size and brightness, the precession of the equinoxes, and other astronomical events.

The essential features of a planetarium include a hall with domed ceiling, on which star images are projected; the projection machine; and the switchboard for controlling the lights. The projector is a cylindrical machine, with many lenses and a powerful electric lamp. It is mounted on wheels, and can be swung to and fro on its frame. An idea

of the complexity of the machine may be gained from the statement that 119 optical projectors are required to illustrate each motion of a celestial object.

The lecturer stands at the switchboard and demonstrates on the artificial sky the facts which he wishes to illustrate. For a pointer, he uses a flashlight, and by means of the numerous buttons on the switchboard, he can show the appearance of the heavens at a given time, the path of any planet, the clusters of stars in the Milky Way, the causes of the changing seasons, and the whole drama of the sun, moon, and stars in movement. As a means of presenting to the observer the facts of astronomy in an objective form, the planetarium is a marvel of modern mechanical ingenuity.

PLANETESIMAL, *plan et es' ih mal*, **HYPOTHESIS.** See GEOLOGY (Hypotheses of the Earth's Origin); NEBULAR HYPOTHESIS; EARTH.

PLANETOID, *plan' et oid*, one of many small planets usually called *asteroids*, revolving about the sun between the orbits of Jupiter and Mars. See ASTEROIDS; SOLAR SYSTEM.

PLANE TREE, AMERICAN. See SYCAMORE.

PLANING MACHINE, an adaptation of the principle of the ordinary hand plane to machinery for planing or smoothing wood and metal. It is usually operated by steam or electricity, power being transmitted by belts and shafting. As used for planing wood, it consists of a drum with cutters attached, rotating on a horizontal axis. The wood to be planed or smoothed passes underneath the drum.

In metal planers, the object to be smoothed is fixed to a traversing table and is moved against a stationary cutter. Planing machines for metal, or planers, as they are generally called, are of various kinds, and are usually named according to the articles they are intended to plane, as *nut planer*, *rod planer*, *plate-edge planer*, etc. In shipbuilding yards, planers are used with sufficient cutting power to remove large strips from the thickest and strongest armor plate made.

PLAN OF IGUALA, *e gwah' lah.* See ITURBIDE, AGUSTIN DE.

PLANOGRAPHIC, *play no graf' ik*, **PRINTING.** See PRINTING, subhead.



The STORY of PLANTS

PLANT, any living thing which is not an animal. To define a plant as "any member of the vegetable kingdom" is to move in a circle, for the vegetable kingdom can only be defined as "the general name given to all plants." The exact dividing line between animals and plants the most skilful scientist has never been able to draw, so simple are the lowest forms of both. Almost anyone, if asked suddenly to give the distinction between a plant and an animal, would probably say "An animal can move; a plant cannot." But a little thought shows that that is not invariably a distinction. Many animals among the lower forms, such as the adult sea squirts, remain fixed all their lives, while, on the other hand, many plants move without the help of any outside agency. For instance, the sensitive plant closes its leaves if they are touched; the Venus's flytrap shuts upon an intruding insect as unfailingly as a horse moves its ear to drive away the troublesome fly; and the tendrils of any climbing plant coil about the nearest support. About all that can be said definitely is, as one author puts it, that "most animals move more freely than do most plants." There are many other partial definitions, including the method of food ingestion, or absorption. Best of all distinctions, probably, is the possession of chlorophyll by plants, with exceptions covering the fungi, bacteria, and a few miscellaneous groups.

In the article ANIMAL are discussed the chief differences between plants and animals—the different gases which they take into their bodies, their methods of digesting food, and, very important indeed, their requirements as to food.

Widespread Distribution of Plants. Few are the places, either on land or in the shallower waters, where plants of some sort do not occur. The presence of hot lava, excessive deposits of salt or alkali, and long-continued extremes of heat and cold, are almost the only conditions which make it impossible for plants to live. Of course they are not equally numerous everywhere, nor have they much resemblance under widely differing conditions. The dusty, scattered sagebrush of the deserts is as truly a form of growing plant life as is the most luxuriant hardwood tree of the tropical forest; it has adjusted itself to the unfavorable conditions under which it grows. The cactus, also a resident of the desert, has thick, juicy leaves which store up moisture and enable it to live for long seasons without rain, just as the camel's peculiar stomach structure permits it to go for days without drinking. Infinite is the variety of the special forms that have developed among plants to fit them for special conditions of life, and no phase of botany is more interesting.



FUNCTIONS OF THE PARTS OF A PLANT

(1) Absorption of water by the root. (2) Section of earth, showing how roots force themselves through particles of soil (3) Enlarged section of stem (4) Top of leaf, revealing waterproof texture. (5) Lower side of leaf, showing stomata [the stoma is the opening between two crescent-shaped guard cells through which air passes into a cavity in the mesophyll of the leaf.] (6) and (7) Front and side views of fully opened flower (8) Bud. (9) Opening bud (10) Stamen. (11) Pistil. (12) Sepal. (13) After petals have dropped The fertilizing agents are the worker bumblebee, shown on 7, and roadside butterfly, shown on 6.

One branch of the subject of plant life concerns the everywhere-present and generally obnoxious class of plants known as weeds. For the most part, these are able to adapt themselves to all sorts of conditions and to thrive without care. Everyone knows how true this is, in his own experience.

Importance of Plants. In general, the value of plants is so obvious that it would seem unnecessary to refer to it, but only on examination is it evident just how important they really are. Directly or indirectly, every animal in the world is dependent upon plants for food. The grazing animals and those that live upon roots, leaves, or any other parts of plants are immediately dependent, but even the flesh-eating animals owe life to plants, for it is on plants that their prey is fed.

Moreover, in one or the other of these fashions, man derives all his food from plants, and this fact demonstrates that farmers and gardeners are really the most important members of human society. A thoughtful glance at what is served at dinner will show this in interesting fashion. Perhaps there is a vegetable soup. It contains carrots—a root; tomatoes—a fruit; onions—a stem; parsley—a leaf growth; and rice—the seeds of a grass. The bread, too, is made from seeds; the dressing for the salad is of olive oil and a vinegar which may be traced back to the juicy apple; the sugar, the flavoring in the pudding, and even the after-dinner mints, are direct plant products, while the steak could never have been produced had there not been a good growth of grass on which beef cattle could feed. Of all that is on the table, salt is not due to plants.

After dinner, the crackling fire in the grate is either of logs straight from the forest, or of coal which is the product of long-ago forests; and the paper on which the pleasing book is printed is no less traceable to plants than is the fragrant cigar. Further tracing of the uses of plants is unnecessary here—the reader will find pleasure in examining the common things about him, and determining for himself just how many of them at one time grew in field or forest.

Evolution of Plants. Scientists no longer believe that every variety of plant was brought into the world separate and distinct from every other variety; to plants as well as to animals they apply the doctrine of evolution (which see). That is, they believe that all plant forms, however complex, have developed through unnumbered ages from the simplest one-cell forms. First to emerge from the single-cell life, they believe, were the algae, and from them the liverworts developed and the fungi degenerated. Out of the liverworts arose the mosses, from them the ferns, and from the ferns, finally, the flowering, or seed, plants. Incredibly slow was the process, and by no means all of its steps have been traced, but enough has been learned from fossil and intermediate forms to convince most students, and to silence the chorus of denial which arose when the great Charles Darwin first astonished the world with his theory of evolution. [See the article EVOLUTION, in these volumes.]

The processes of growth and change still go on, though often too slowly to be visible, and man with all his study and with all his plant breeding can only assist in it. This assistance, too, is under definite limitations. Through well-considered hybridization, and subsequent selection and breeding, the plant scientist has made fruits, flowers, and seeds larger, but apparently he has not been able to stimulate or induce marked evolutionary changes. The seedless orange was a natural "sport," and the cactus without thorn existed long before it was utilized in breeding. The earliest known wild rice had tiny, unpalatable seeds, while the rice of to-day has a vastly enlarged and improved seed which furnishes food to millions of people; but the little first seed was just as capable of producing new plants as is the developed seed, and that is the main function of a plant—to reproduce itself.

Plant Parts. The higher or vascular plants have those highly developed organs distinguished as roots, stem, leaves, flowers, and fruits, the latter containing the seed. The roots hold the plant in place and absorb from the soil water and food; the stem supports the leaves and blossoms, carries the sap from the roots to the upper parts of the plant, and distributes organic food originating primarily in the leaves; the leaves absorb carbon dioxide, manufacture the sugar or carbohydrate, and give off oxygen; the flower produces the fruit, the chief purpose of which is to contain the seeds. B.M.D.

Related Subjects. The scope of the plant department as treated in these volumes is indicated by the articles listed below. Most of the specific plants whose descriptions may be found under their individual titles are listed in the indexes following general articles.

Carnivorous Plants (with list)	Medicine and Drugs (with list)
Fiber (with list)	Nut (with list)
Flowers (with list)	Poisonous Plants (with list)
Fruit (with list)	Shrub (with list)
Grains (with list)	Spice (with list)
Grasses (with list)	Tree (with list)
Herbs (with list)	Vegetables (with list)
Leguminous Plants (with list)	Weeds (with list)

DESERT PLANTS

Cactus	Mesquite
Century Plant	Sagebrush
Chaparral	

DYE PLANTS

Logwood	Turmeric
Madder	Woad
Safflower	

FLOWERLESS PLANTS

Algae	Liverworts
Blight	Maidenhair
Brake	Mildew
Cycads	Mold
Diatom	Mosses
Dodder	Mushrooms
Ferns	Puffball
Fungi	Rusts
Iceland Moss	Seaweed
Irish Moss	Slime Molds
Lichens	Smuts

MISCELLANEOUS PLANTS AND PLANT PRODUCTS

Arrowroot	Orris Root
Bay Rum	Palm Oil
Bergamot	Resins
Cassava	Rosin
Cat-Tail	Rubber
Colocasia	Sap
Gamboge	Sealing Wax
Gum	Snuff
Gum Arabic	Starch
Gum Resins	Sugar
Gutta-Percha	Sugar Cane
Hops	Tapioca
Jumping Bean	Tar
Labrador Tea	Tobacco
Linseed Oil	Turpentine
Maté	Veneer
Olive Oil	Vinegar

PLANT, MORTON F. (1852-1918), one of the leading men of the United States in railroad and coastwise transportation. He was born at New Haven, Conn., the son of Henry B. Plant, founder of the Southern Express Company. After receiving his education at Russell's Military School, he began a business career in 1868, working in his father's firm at Memphis, Tenn. Sixteen years later, he became vice-president of the Plant system of railroads, which had been organized by his father. In 1902, when the system became a part of the Atlantic Coast Line Company, he was made a director; also, as vice-president and director of the Peninsular and Occidental Steamship

Company, he vastly extended the lines of transportation. His principal hobby was yachting, and he was very prominent in the sport.

PLANTAGENET, *plan taj' e net*, a surname derived from the words *planta*, meaning *sprig*, and *Genista*, the generic name of the broom plant. It was applied to Geoffrey, Count of Anjou, founder of the Plantagenet family, because of his wearing a branch of the broom in his cap (see BROOM). Fourteen English monarchs bore this name, from 1154 to 1485. The family was divided into the York and Lancaster branches in 1400, the former known as the *White Rose*, the latter as the *Red Rose*. The House of Tudor was founded by their union in 1485.



BADGE OF THE HOUSE OF PLANTAGENET

Related Subjects. Detailed history of the Plantagenets will be found in the following articles in these volumes

England (History)	Roses, Wars of the
Henry (VII, England)	Tudor
Lancaster, House of	York, House of

PLANTAIN, *plan' tin*, the common name of a genus of low-growing herbs, several species of which are common weeds. The *common*, or *broad-leaf*, *plantain*, which gardeners find so troublesome, may be recognized in the spring by its rosette of broad, light-green leaves, which spring from the roots. From the center of the leaf clusters are sent up tall, slender spikes, densely covered, all summer long, with tiny green flowers (see illustration). This weed is spread by the birds, which eagerly feast on the seeds and help to scatter them about. The seeds are also fed to cage birds. Other well-known species are the *narrow-leaf plantain*, or *rib grass*, with narrow leaves and short, thick spikes, and the *seaside plantain*, the leaves of which are used to allay inflammation.

There is also a tropical plant of this name, considered by some authorities a species of banana. The fruit closely resembles the banana, and though not so sweet nor so pleasing in flavor, it forms one of the chief articles of food in tropical countries (see BANANA). B.M.D.

Scientific Names. The plantain genus is known botanically as *Plantago*, family *Plantaginaceae*. The broad-leaf plantain is *P. major*; the narrow-leaf is *P. lanceolata*; the seaside is *P. decipens*.

PLANT BREEDING. See BREEDING.

PLANT HUSBANDRY, IMPROVEMENTS IN. See AGRICULTURE.

PLANT INDUSTRY, BUREAU OF. See AGRICULTURE, UNITED STATES DEPARTMENT OF.

PLANTING TIME-TABLE. See VEGETABLES; FLOWERS (Suggestions for Flower Gardens).

PLANT LICE. See APHIDES.

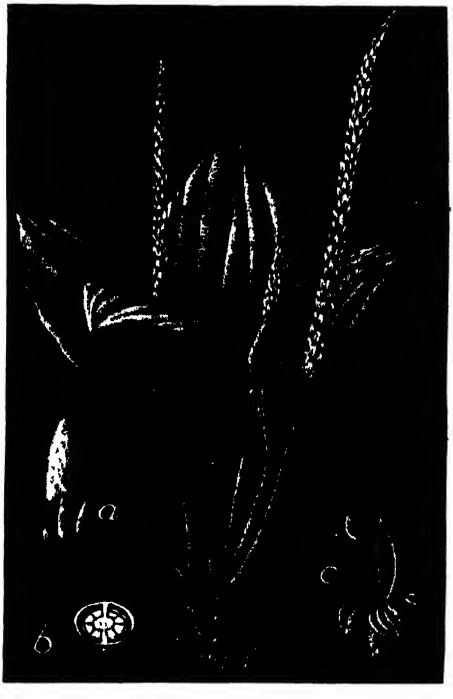
PLANTS, DISEASES OF. See DISEASE (Diseases of Plants).

PLANTS, SOIL-FORMING. For an account of the work done by plants in the formation of soil, see SOIL.

PLASMA, *plaz' mah*. See BLOOD (Composition of the Blood).

PLASMODIUM, *plaz mo' dih um*. See SLIME MOLDS.

PLASSEY, *plas' e*, BATTLE OF. See CLIVE, ROBERT, BARON CLIVE OF PLASSEY.



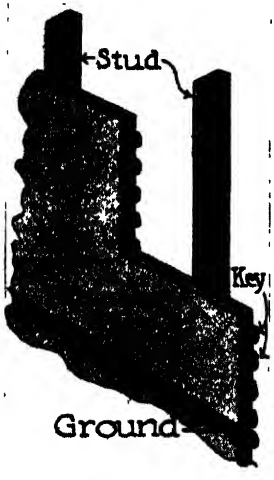
THE PLANTAIN

(*a*) Fruit, (*b*) cross section of fruit; (*c*) flower.

PLASTERING is the application of mortar or other plastic material to the walls and ceilings of buildings, or, for exterior use, to outside walls, ornamental fences, and gate posts. Its interior use is designed to serve for warmth and as a foundation for decorative features, as wall paper, paint, or calcimine. The outside work is usually classed as stucco.

Preliminary to plastering, the walls or other surfaces must be prepared to receive the plaster. In some instances, the plaster is applied directly to the rough brick wall, in which case it is necessary to clean and dampen the wall to be surfaced. The usual method, and by far the

best, is to fur out by nailing vertical furring strips of 1″ x 2″ wood, placed 12″ or 16″ apart, directly to the wall. These strips are plumbed up with wedges driven in behind them until they form a vertical plane on which to nail the laths. This forms an air space between the wall and plaster, which acts as an insulator from heat, cold, and dampness

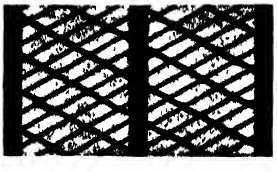


LATH AND PLASTER

The plaster is keyed down on side walls Laths are one-quarter of an inch in thickness, one and a half inches wide and four feet long, made of rough-sawn pine, spruce, or hemlock, well-seasoned, straight-grained, and free from sap or knots They are sold in bundles of 100

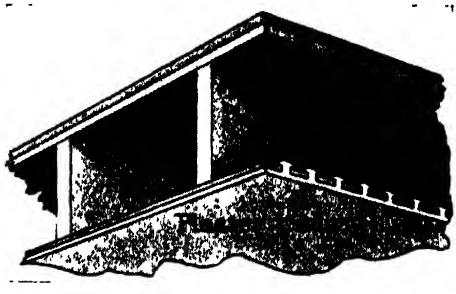
The laths are nailed in place on the furring strips in parallel rows, spaced ¼″ apart to allow the plaster to be forced through, and partly over the back of the lath to form a key or hook. This key is what keeps the plastering from separating from the lath and falling down. The laths are nailed on in panels of about 18″ in width, and staggered so that there will not be a continuous joint on any support.

In frame construction and on ceilings, the laths are nailed directly to the studding or joists. Tile blocks used for partition walls are cast hollow and have dovetail grooves on the outside faces to key the plaster. *Grounds* are square wood strips the thickness of the finished plaster (⅞″ for three-coat work). These strips are nailed around all openings and along the bottom of the walls to form an end or stopping place for the plaster. This step aids the plasterer in making the wall a uniform thickness, and also furnishes a nailing strip for the trim. *Corner beads* are nailed to the laths on all exposed corners or exposed edges. They protect the plaster from being chipped off.



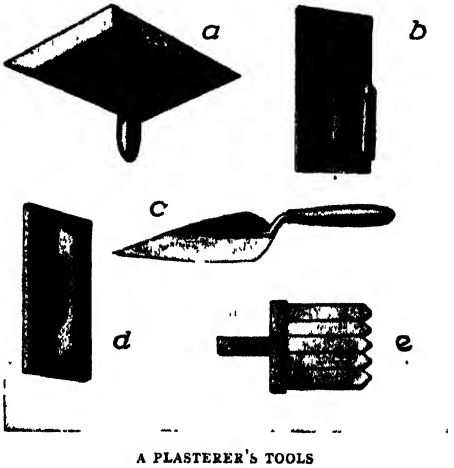
METAL LATH

Plaster is a composition of slaked lime and a fine-sieved sand, made by wetting lumps of lime in a tight box. After slaking, clean sharp sand is added in the proportion of two parts sand to one part lime. Long, clean cattle hair or fiber is added as a binder. The rough mass is now allowed to stand about seven days, so as to become thoroughly moist. This mortar is known as first coat, and is worked to a smooth, tough consistency when ready to be used. It is spread firmly over the laths in a coat about ¼″ thick, with enough pressure to force it between and through the laths to form the key. When almost hard, it is scratched with a wood comb, to form a key for the second coat.



PLASTER CEILING

The second, or brown, coat is prepared by mixing one part slaked lime with three parts sand and adding a slightly less quantity of hair It is applied after the first coat is thoroughly dry. During the process of applying this coat, the wall is straightened and trued up plumb.



A PLASTERER'S TOOLS

(*a*) Hawk, on which he holds mortar, (*b*) trowel, for laying plaster, (*c*) trowel, for work in corners, etc , (*d*) float, for smoothing and plumbing, (*e*) comb, used to roughen the scratch coat.

The third coat is in the form of a stiff paste made up of lime putty and equal parts of plaster of Paris and marble dust, or lime putty and manufactured hard wall plaster. It is put on with a steel trowel, and is thoroughly worked

over and brushed to a hard, smooth surface. A sand-finish wall is made by mixing lime putty and clean beach sand, this plaster being put on with a wooden float.

Estimating Costs. Ordinary plastering is paid for by the square yard, and in measuring for it no deduction is made for window or door spaces (unless they are very large), nor for ordinary baseboards. Thus the amount of plaster in a room fourteen feet long, twelve feet wide, and eight feet high would be computed as follows:

Distance around room, in feet, 12+14+12+14=	52
Multiply by height, in feet	8
Area of walls, square feet	416
Add ceiling, 12 ft ×14 ft	168
Total area to be covered, square feet	584
Reduce to square yards (divide by 9)	64⅞
See DENOMINATE NUMBERS	C A C

PLASTER OF PARIS. If gypsum is ground and then baked to drive off the water, a fine dry powder, called plaster of Paris, is formed. From mixing one part of this powder with two parts water, a thin paste results, which hardens quickly on exposure to the air. This property of plaster of Paris makes it valuable for casts and for stucco work, and it is extensively used for both purposes By adding a small quantity of lime to the paste, a very hard substance resembling marble is produced Under the name of *calcine plaster*, this mixture is often used to cement lamps to their sockets and for fastening fixtures in place where screws and bolts cannot be used. See GYPSUM; STUCCO.

PLASTRON. See TURTLE.

PLATA, RIO DE LA, *plah' tah, re' o da lah.* See RIO DE LA PLATA.

PLATAEA, *pla te' ah.* See THEBES.

PLATAEA, BATTLE OF. See GREECE (The Period of Glory).

PLATEAU, *plah toh'*, an elevated plain formed in a mountainous region by the uplifting of great sections of rock. Plateaus owe their formation to the same movements that created the mountains. The distinction between a plateau and a plain is chiefly one of altitude, the latter being generally not more than a thousand feet above sea level. Plateaus are also more rugged, and, because of their higher altitude, their streams cut deeper valleys than do those of plains. These valleys may take the form of huge gorges, such as the famous Grand Canyon in Arizona. Sometimes a plateau is so carved by nature's sculptors, wind and water, that it takes on the appearance of a range of mountains. This is true of the Catskills in New York, for these beautiful hills are really a part of the Allegheny plateau.

In North and South America, the higher plateaus are on the western side of the continents, and the lower ones on the eastern side. A plateau about a mile and a half high lies between the Rockies and the Sierra Nevadas in North America, and one in Bolivia, South America, is bordered by the giant peaks of the Andes. The loftiest plateaus on the earth are found in the Himalaya regions of Central Asia —"the roof of the world." In regions where there is little rainfall, smaller flat-topped areas are often found rising from the main plateau. Such formations, called *mesas*, are the work of erosion. Economically, high plateaus are of little value to mankind because their ruggedness makes commercial intercourse difficult or impossible, and climatic conditions are not favorable to the support of any considerable population. Those of lower altitude are sometimes excellent grazing grounds for sheep and cattle. Such areas are found in Western United States and in Western Australia. The plateaus of the Appalachian regions in Eastern United States have valuable deposits of coal. R.H.W.

Related Subjects. The reader is referred in these volumes to the following articles

Catskill Mountains	Grand Canyon	Plain
Erosion	Mesa	Tibet

PLATEAU DU COTEAU, *ko toh'*, **DU MISSOURI.** See NORTH DAKOTA (The Land).

PLATEAU INDIANS. See INDIANS, AMERICAN (The Early Indians in the United States and Canada).

PLATE GLASS. See GLASS (How Polished Plate Glass Is Made).

PLATELETS. See BLOOD (Composition of the Blood).

PLATFORM SCALE. See WEIGHING SCALE.

PLATINUM, a rare, precious metal, from four to five times more costly than gold. Though widely distributed, platinum is found in sparse quantities considering the demand for it, and a decrease in its production in Russia has recently added to its expensiveness.

Platinum ore was discovered in Peru, South America, about the middle of the eighteenth century. The Spaniards there gave it a name derived from their word for *silver*, because it looks much like silver. This ore, called *native*, or *crude*, platinum, is usually found in beds of gold-bearing sands or other alluvial deposits. The miners call it "white gold." It occurs mostly in small, irregular grains which contain several rare metals, such as iridium, osmium, rhodium, palladium, and ruthenium, in addition to a little iron, copper, chromium, and titanium. Occasionally, large nuggets of native platinum are seen. A lump weighing more than twenty-one pounds was found in Russia in 1843. The ore contains from sixty to eighty-five per cent of pure platinum.

Properties. Platinum is a chemical element (symbol *Pt*). It is grayish-white in color and is one of the heaviest substances known, being about twenty-one times as heavy as water.

It is highly malleable and ductile, and in these properties is surpassed only by gold and silver. It melts at a temperature of about 3,200° F.

Platinum is not oxidized in the air, and it is not attacked by any of the pure acids. It dissolves only in *aqua regia* or nitro-muriatic acid and in mixtures which generate chlorine. Platinum combines directly with phosphorus, arsenic, silicon, and with almost all other metals. It forms useful alloys with gold, silver, steel, and iridium.

Uses. On account of its power of withstanding heat and the action of chemical reagents, platinum is much employed as a material for making vessels and crucibles which are used in chemical laboratories and in many chemical industries. It also fills an important place in the manufacture of sulphuric acid, where it acts as a catalyzer; that is, as a substance which by its presence helps the chemical combination of other elements (see CATALYSIS). It is especially useful in chemical experiments in the fixation of atmospheric nitrogen. Platinum is valued by makers of expensive jewelry, for it is considered to be the best setting for precious gems. Exquisitely delicate designs are possible in platinum settings, because the metal can be drawn into the finest of fine wire. Furthermore, platinum jewelry does not tarnish. The alloy of platinum with iridium possesses an excellent and unalterable surface for fine engravings. The standard units of weights and measures are made from this alloy, and it is also used for making contact points in electrical equipment, points of fountain pens, and surgical instruments. Platinum itself finds some use in dentistry, but is being replaced by cheaper materials. The salts of the metal are valued in photography.



PLATO

Production. The Ural Mountains in Russia contain the largest known deposits of platinum, but production has been greatly curtailed since the Soviet revolution. After the close of the World War, the chief sources of supply were Colombia, in South America, Borneo, the United States, and Canada. Early in 1923, platinum ore was discovered in the Waterberg district of the Transvaal, South Africa, and within a year several companies were developing this field. Platinum is obtained in the United States from the gold-bearing deposits of California, Oregon, and Nevada. A considerable amount is also extracted in the process of refining gold and copper. T.B.J.

Related Subjects. The reader is referred in these volumes to the following articles:

Alloy	Malleability
Aqua Regia	Osmium
Chemistry	Palladium
Ductility	Russia
Iridium	Ural Mountains

PLATO, *pla' toh* (427-347 B.C.), one of the greatest of Greek philosophers, was born on the island of Aegina, belonging to Athens. His father was Ariston, a descendant of Codrus; his mother, Perictione, was said to have been of the line of Solon. In his youth he received the customary education of the age, and tradition states that he wrote poetry and won distinction in gymnastics; also, that through the influence of Socrates he turned to philosophy at the age of twenty. Without positive basis of truth, it is also said he traveled extensively in Greece, Sicily, Italy, Egypt, and Northern Africa; and that Dionysius of Syracuse sold him into slavery at Aegina, though friends rescued him immediately. In 387 B.C., he was in Athens, and there established his school, the "Academy," on an estate one mile from the city. The last years of his life are wrapped in obscurity, and the numerous legends regarding him have been almost entirely discredited.

His greatest work is the *Republic*, in which are outlined plans for an ideal State. Its purpose was to be the training of citizens to become virtuous; its aim, the true happiness of the individual. Although Plato realized that this ideal commonwealth could never be attained in an imperfect world, he constantly held it up as an end toward which all should strive. In it each human soul would be best fitted for its proper work. The citizens would be divided into three classes, according to the three dominant virtues of the soul—the governing class (whose virtue is wisdom); the military (valor); the industrial (self-restraint and willing obedience). Art, the Beautiful, and all other things would be subordinate to the Good.

It is practically impossible to formulate Plato's system of philosophy in a few sentences. An eighteenth-century writer thus summarizes it, and his view accords with twentieth-century thought:

> Platonism appears as the most Greek of all philosophies, since it does not, like the Ionian and Eleatic doctrines that preceded it, reflect merely a single peculiarity of a single stock, but has included within itself all previous philosophy and reflects the Greek spirit as a whole.

It falls naturally into three classes: dialectics (or logic), physics, and ethics. It became an idealistic, rather than a realistic, theory of things. He accepted Socrates' doctrine of virtue, that virtue is dependent on knowledge, and that truth and the good exist inseparably. From a study of the particular virtues, he rose to a conception of virtue in general. The moral ideal becomes the one, the good, the true. Individual things are fleeting; the general idea alone is permanent. The tree, the man, the

flower pass away and change; the general concept—tree, man, flower—however, remains unchanged. The general concept, or the *Idea*, therefore alone has true *being*.

Reasoning thus, he formulated his celebrated doctrine of Ideas. Just as there is a material world known through our senses, so there must be another, or "other," world of our ideas, of which we cannot gain any knowledge through our perceptions. Thus are the claims for an "immaterial reality" consciously and fully expressed, and a doctrine of Idealism expounded that became one of the most fruitful and forceful processes of all European thought. And through it all run the two persistent threads: "Reason guiding will is the supreme factor," and "There is identity between the true and the good."

With Plato, all of Greek thinking reached the very height of its development. With him, for the first time, philosophy had its realization, and the natural and spiritual worlds were reconstructed scientifically in accordance with philosophical principles. His influence on Aristotle (his immediate successor), the Stoics (see STOICISM), Plutarch, the Christian fathers, the writers of the Renaissance, and the whole of modern thought has been permanent and far-reaching.

His Books. There is no evidence that any of Plato's writings have been lost, but many formerly accredited to him are now regarded as not his His works are all in the form of dialogues, in which he attained unparalleled depths of beauty, truth, and grace The important ones include *Laches, Charmides, Lysis, Protagoras, Io, Meno, Euthyphro, Apologia, Crito, Phaedo, Symposium, Phaedrus, Cratylus, Gorgias,* the *Republic*; the dialectical or argumentative dialogues *Timaeus, Critias,* and the *Laws*. The *Euthyphro, Apologia, Crito,* and *Phaedo* refer especially to the trial and death of Socrates, who appears in each of them as the man of ideal piety, the reformer, the law-abiding citizen, the recluse dwelling on eternal themes

Related Subjects. The student of Plato will find valuable information in these volumes in the articles PHILOSOPHY; CONCEPT, PERCEPTION; REASON. See, also, CODRUS; SOLON.

PLATOON, an army unit. See diagram, page 414.

PLATOON SCHOOL, a plan of organization of the elementary school, so called because the entire enrollment of the school is divided, by classes, into two groups, or platoons, which alternate between the "home rooms," where the "three R's" are taught, and the rooms for special activities, such as music, drawing, manual training, sewing, cooking, etc. Thus, half of the pupils are in the home rooms at any given time, and the other half are engaged in special activities. The classes of Group 1, for example, may be in their home rooms having an arithmetic or reading lesson, while their companion classes in Group 2 may be in the music room, the drawing room, or on the playground, or in the "community" room, where pupil programs of social and civic value are carried on. When the pupils of Group 2 go into the home rooms, those of Group 1 move on to one of the special-activities rooms.

The plan is so arranged that every room is used by some group every period of the day, thus providing for a maximum use of school facilities. This program may be carried down into the lower grades as far as it seems feasible to the local school administration. In some platoon schools, the first three grades are omitted in the organization; in others, grades one and two; and in still others, only the first grade, the thought being that primary children need the attention of a "mother-teacher's" care all the time, and are too immature to move about from room to room without guidance.

The first school of platoon type was organized by William Wirt in Gary, Ind., in 1906. There had been a growing conviction among educators that school should be a place where the child not only learns reading, writing, and arithmetic, but is also brought into contact with real social and industrial experiences, and where he is trained in effective self-expression and self-direction in both work and play activities. It is this latter aspect of the platoon school which has given to it also the name of the "work-study-play" school, since all these activities are incorporated in the program of the day. It was Wirt's purpose to organize a system which would embody these social aims of education and enrich the curriculum, without additional cost. Hence he eliminated the "reserved-seat" idea of the schoolroom, and planned to make every seat in every room serve some pupil every period of the day.

By 1920 thirty-five other cities had adopted the plan in some or all of their schools. In February, 1929, statistics showed the system in operation in 740 schools in 115 cities scattered through thirty or more states. In thirty-four of these cities, the platoon school had by this time been adopted as a city-wide policy, and in twenty-two of them, all schools were already so organized. Among the cities which have given wide recognition to the platoon school, and have adjusted it to suit their individual needs, are Detroit, Mich.; Pittsburgh, Pa.; Chicago, Ill.; Newark, N. J.; Denver, Colo.; Seattle, Wash.; Saint Paul, Minn.; Sacramento, Calif.; and Dallas, Tex. The system has thus spread from north to south and from east to west, with country-wide interest in its development. Cities that have used the platoon plan hold that it can be adapted to the needs of small schools as well as larger ones. The great majority of the schools in which it has been used, however, have an enrollment of between 500 and 1,500 pupils.

The chief advantages claimed for the platoon school are as follows:

1. It provides maximum use of school facilities, and therefore increases the capacity of buildings, making it possible to house more pupils in the same school plant. This makes for business efficiency and economy.

2. A specially trained teacher is employed for each of the special activities in music, drawing, physical education, etc. This means that the pupils receive far better instruction in each of the subjects than is possible under the plan of having only one teacher teach all subjects.

3. A special room is provided for each of these special activities, in which the equipment and entire environment give the proper background for the work. Thus there is real atmosphere and inspiration for carrying on the training in each field

4. The work in the special-activities rooms is not given for the purpose of mastering subject matter; rather, there is an attempt to help pupils to work cooperatively, to give them an opportunity to express themselves in self-chosen projects, and to awaken an appreciation of good music, good literature, and art. Emphasis is thus placed on the social aim of education

5 In the home rooms, there is opportunity for thorough mastery of the fundamental subjects through the socialized-recitation plan, or through the use of individualized material by means of which a pupil may progress at his own rate (see EDUCATION, page 2114) Thus there is no sacrifice of training in the "three R's," and at the same time there is every opportunity for a broad, rich curriculum.

On the other hand, the arguments presented against the plan are as follows·

1 The number of different pupils whom each special-subject teacher must care for during the day is too large for the most effective work.

2. Each pupil, in going from room to room for various activities, must meet from eight to ten different teachers For children below the seventh or eighth grade, this is confusing and not conducive to good learning

3. With the fundamental subjects of reading, writing, and arithmetic (which are taught in the home rooms) divorced from instruction in music, art, science, and other special activities, there is an inevitable tendency to make mechanical and formal the drill in the "three R's" For vital results they need to be tied up with the inspirational influence of the special activities. In the modern school which is not organized on the platoon plan, this is entirely possible through the correlation of one subject with another.

4. By having all groups change from room to room at a given signal, the mechanical clockwork of operating the plan is given undue emphasis. Any opportunity to make the day's work flexible and adjustable to varying conditions is eliminated.

5. No one room can be equipped with seating and work apparatus which would be suitable for all ages of pupils Since all grades are expected to use the same room for each activity, there is bound to be difficulty in the physical adjustment of the room.

It is evident from the foregoing statements given for and against the platoon system that educators are not altogether agreed as to the merits or demerits of the plan, as compared with the modern school which is not so organized. Arguments on both sides have been presented in educational discussion throughout the United States. Only continued experimentation can determine whether the system is one which should supersede other types of schools in modern educational practice. V.E.D.

PLATT, THOMAS COLLIER (1833-1910), an American political leader, long a prominent figure in the Republican party, was born at Oswego, N. Y., and educated at Yale University. His political career began with his election in 1859 as clerk of Tioga County; in 1872, after he had become the political friend and ally of Roscoe Conkling (which see), he was elected to Congress. He was secretary and director of the United States Express Company, and later its president He returned to politics in 1880 as quarantine commissioner at the port of New York.

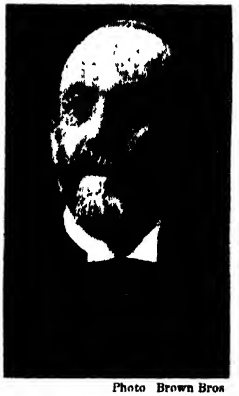


Photo Brown Bros

THOMAS C. PLATT

In 1881 Platt was elected United States Senator, but shortly afterward both he and his colleague, Senator Conkling, resigned, because President Garfield would not follow their wishes in making appointments. The New York legislature failed to reelect them, but Platt withdrew before the final vote With the defeat of Conkling, Platt became head of the Republican organization in New York. He regained his seat in the Senate in 1897 and was reelected in 1903. He claimed credit for nominating Theodore Roosevelt for governor of New York, and later asserted that he forced Roosevelt to accept the nomination of Vice-President in order to remove such a powerful rival to his political power in the state. Platt's influence declined after 1903, though he continued as a member of the National Republican Committee, and attended all the Republican national conventions as a delegate until his death in 1910.

PLATT AMENDMENT. See UNITED STATES (Relation to Other Countries).

PLATTDEUTSCH, *plaht' doich,* **LOW GERMAN,** or more correctly, **LOW SAXON,** is the language spoken in the lowlands of Northern Germany, a territory comprising about one-third of the German republic. Plattdeutsch differs from High German chiefly in its consonant sounds; the use of *ik* in Low German in the place of the High German *ich* (I) is so distinctive a feature that the general bound-

ary between High German and Low German territory is often spoken of as the *ich-line*. Plattdeutsch is more like the Dutch of the Netherlands and more like English than is the High German.

Up to the seventeenth century, Low German was both the literary and the vernacular language of Northern Germany. The popularity of Luther's High German version of the Bible had much to do with that dialect's growth in popularity and its use as the literary language.

To-day, High German is the language of the schools, the government, and in the main of the educated classes. Plattdeutsch persists in North Germany, although it is changing constantly, adding contributions from the High German. See PHILOLOGY; GERMAN LANGUAGE; NETHERLANDS, THE (Language and Culture).

PLATTE, *plat*, RIVER, the most important waterway of Nebraska and one of the largest tributaries of the Missouri. It is formed by the union of two branches—the North and the South Platte—each of which has its source in the mountains of Northern Colorado. The head of the main stream is in Western Nebraska. From there the river flows in a general easterly direction across the state, emptying into the Missouri at Plattsmouth. The length of the North Platte, the longer of the two branches, is about 650 miles, and of the main stream, over 200 miles. The region drained by the river and its branches is about 84,600 square miles, included in which are some of the best irrigated sections of Colorado and Nebraska. Navigation on the Platte is of no importance, because the stream is shallow.

PLATT NATIONAL PARK. See PARKS, NATIONAL.

PLATTSBURG, N. Y. See NEW YORK (back of map).

PLATYPUS, *plat' ih pus*. See DUCKBILL.

PLATYHELMINTHES, *plat ih hel min' theez*. See ZOÖLOGY (Divisions of the Animal World).

PLAUTUS, *plaw' tus*, TITUS MACCIUS (about 254-184 B.C.), the greatest comic poet and dramatist of ancient Rome, was born at Sarsina, a village of Umbria. Little is known definitely of his early life, except that he probably went to Rome while a youth, and there was first employed in some unknown capacity in a theater. Later, he left Rome, setting out on a business venture, but soon returned penniless, when he was forced to earn his living by turning a hand mill for a baker. While thus employed he wrote three plays, and their sale enabled him to forsake the drudgery of his work and enter upon a literary career. This was in 224 B.C., and for forty years he continued to write dramas which delighted not only enthusiastic playgoers, but critics as well.

He is said to have written at least 130 plays; of these only twenty are now extant, and it is even uncertain that he was the author of all of them. He borrowed heavily from Greek comic drama, but his own distinct contributions were the development of the lyrical element, the vigor of his character delineation, and the emphasis on national (Roman) elements in his humor and in the life he portrayed.

Later dramatists, even the greatest of them, have found much in the comedies of Plautus to imitate. His *Amphitruo*, for instance, a laughable presentation of twin brothers whose resemblance leads to all sorts of ludicrous mistakes, is of special interest to English readers because it formed the basis and furnished more than a hint as to the working out of Shakespeare's *Comedy of Errors*. The best-known of his plays, however, is his *Miles Gloriosus*, whose hero, a coward, is finally exposed—a popular character for comedy of later centuries.

Among other works generally associated with Plautus' name are *Aulularia*, *Bacchides*, *Casina*, *Cistellaria*, *Menaechmi*, *Mercator*, *Stichus*, *Persa*, and *Vidularia*.



PLAY. The word *play* has a number of meanings, each depending upon the way in which it is used. We speak of playing games, of playing on a musical instrument, and of a dramatic composition as a play. When applied to machinery, play means freedom of movement, or operation without friction. This article is restricted to discussing the play of children. Used in this sense, play means action without special aim, or for amusement.



Photo, Visual Education Service

A MUNICIPAL PLAYGROUND

The grounds shown above are in Oakland, Calif. That city has more than fifty, similarly equipped.

Play is regarded from various viewpoints, each radically different from the others. Among them, the four theories accorded the widest acceptance are these:

1 Play is the result of surplus energy of mind and body, typical of healthy childhood.

2 Active physical exercise is necessary for growing bodies; taken in moderation, it reacts favorably on the mind. In childhood this exercise is obtained through play.

3. Play affords the means for the development and direction of man's many complicated instincts which are undeveloped.

4. Play is the medium by means of which the habitual activities of our remote ancestors are relived and practiced by us to-day.

5. It is a preparation for the serious work of life in maturity.

Necessity of Play. Doubtless there is more or less truth in all these theories, but the average adult considers play as a means of recreation. The business man plays golf to give him needed physical exercise, and to get his mind away from the cares of his office. If he sees his young son and several other children playing at hide and seek, he thinks they are doing it for recreation, too, thus attributing to the child the same motives for play as lead him to seek recreation on the golf links. A moment's thought will convince us that this position is not correct. The child does not play because he is weary and needs diversion, neither is he engaged in the game of hide and seek for the exercise derived from it. He plays merely for the sake of playing. He has no other purpose. But he is responding to an instinct that is vital to his full development. "Play is not a luxury, but a necessity; it is the serious business of a child's life; indeed, for young children it is life itself!" This statement from an eminent authority leads us to consider what play does for the child.

Play Is a Means of Self-Expression. The child may learn facts by having them repeated to him by others, but it is only through self-activity that he develops his powers, and the greater the freedom in early years, the more complete the development.

Play Trains the Child in Decision. In nearly all games, the child is confronted with the necessity of making instant decisions and in acting upon them. No occupation in which he can engage in his early years will give him this training so fully as will play.

Play Develops Self-Confidence. In his games the child must rely upon himself; in his work he may call upon others for guidance. The game calls for instant personal decision. If the child wishes to emulate his playmates, he must act upon his own decisions, and continual practice in so doing develops independence.

Play Is Necessary to Health. Health and endurance depend largely upon the full development of the heart, lungs, and other vital organs; nothing else contributes so much toward securing this result in children as vigorous play in the open air.

Play Trains in Coöperation and Loyalty. Many games require team work, and success depends upon loyalty to the organization and obedience to the commands of the leader.

Play Favors Democracy. On the playground, native ability is recognized, and all children are given an equal chance. "We may say that the playground is the true melting pot of the various races coming together in the American nation."

Relation of Parents and Teachers to Play. Play begins in the home, and the wise mother assists the little child in learning to play by teaching it games in which she joins. When the boy has reached the age of eight, he needs and should have his father's help in his games. All parents should remember that time which the child devotes to play is most profitably spent, provided the play is of the right sort.

Much can be done in helping children to use to their best advantage the seven or eight hours a day in which they are not in school or asleep, by teaching them how to play. Playground associations, Y. M. C. A.'s, and institutional churches are doing this work for the children of large cities, but wherever it is possible, the work should be done by the parents.

Teachers should introduce new games and assist the pupils in learning them. This is especially needed in rural schools, where often the pupils know but little about play.

"The child plays not because he is young, but he is young because he plays." All parents and teachers should keep young. M.V.O'S.

Related Subjects. In connection with this discussion of play, the reader is referred in these volumes to the following articles

Amusements (with list)	Games and Plays
Athletics (with list)	Kindergarten
Child	Story-Telling
Dolls	Toys
Education	

PLAYER PIANO. See PIANO

PLAYGROUND OF EUROPE, a popular name applied to Switzerland (which see).

PLAYING CARDS. See CARDS, PLAYING.

PLEADING. See COURTS (Court Procedure).

PLEASANT, MOUNT. See WHITE MOUNTAINS.

PLEBEIANS, *ple be' yanz,* the lower class in ancient Rome, as opposed to the patricians. Originally there was no such class, the population of Rome consisting only of the patricians and their slaves and clients, who had neither political rights nor personal freedom. As the Latin towns in the territory about Rome were gradually brought into subjection, numbers of their inhabitants were taken to Rome, and while a few were admitted to the patrician ranks, most of them were kept in subject relation to the original Romans, thus forming the nucleus of the plebeian order, which in time far surpassed the patricians in number.

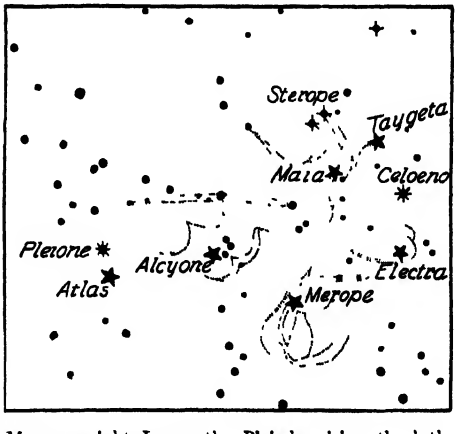
The plebeians might hold land, but they had no political rights, and they were not even allowed to intermarry with the higher class. Some few privileges were allowed them under the later kings, but it was not until the time of the republic that they made a determined stand and demanded equal rights with the patricians. After they had gained permission to appoint tribunes to protect their interests, their progress toward political equality was rapid, and in the third century B.C., the two classes were made practically one, with no distinction before the law. See PATRICIAN; ROME (Classes in Early Rome).

PLECOPTERA, *ple kop' tur ah.* See INSECT (Classification).

PLEHVE, *pla' veh,* VIATSCHESLAF KONSTANTINOVICH (1846-1904), a Russian statesman who incurred the lasting hatred of the Poles, Jews, and Finns because of his support of autocratic principles. He was born in Poland, the son of a poor noble, and was educated at Warsaw and Saint Petersburg (now Leningrad). In the latter city he rose rapidly to the post of assistant solicitor-general, and subsequently to that of director of state police. In 1881, acting with the Minister of the Interior, he favorably attracted the czar by his able investigation of the assassination of Alexander II.

In 1894 Plehve became Secretary of State, and in 1902 was appointed Minister of the Interior. He earned the bitter hatred of the alien provinces within Russia by his stern methods of dealing with the mixed Russian masses, for he opposed all liberal reform as productive of a dangerous middle class. Early in 1904, an unsuccessful attempt was made upon his life, and in July another attempt resulted in his assassination by a member of the Socialist Revolutionary party. Plehve's policies did much to increase the discontent of Russia's millions, and possibly hastened the revolution which, in 1917, drove the czar from his throne. See RUSSIA (History).

PLEIADES, *ple' ah deez,* a constellation containing seven stars, of which six are visible to



Many a night I saw the Pleiads, rising thro' the yellow shade,
Glitter like a swarm of fire-flies tangled in a silver braid —TENNYSON: *Locksley Hall.*

the naked eye; the seventh is easily discernible with the aid of a small telescope. Observers with keen eyesight can see additional stars,

and it is said that Maestlinus, the tutor of Kepler, "could reckon fourteen stars in the Pleiades, without any glasses." With a large telescope, several hundred can be seen, and photography reveals thousands of stars in this region.

According to legend, the seven stars are the daughters of Atlas and the nymph Pleione, who were transformed into stars by the gods and placed in the sky. There are several versions. One states that the seven committed suicide through grief because of the death of their sisters, the Hyades. Another version is that the fate of Atlas, who was turned into a mountain at sight of the head of Medusa, led to their suicide. The six visible stars form a small dipper-shaped group and are named Electra, Maia, Taygeta, Alcyone, Atlas, and Merope. The invisible one, Sterope, is said to hide herself in shame because she alone of the seven married a mortal.

The Pleiades may easily be recognized on any clear night. They are situated in the neck of Taurus, somewhat northwest from Aldebaran. See chart, *The Heavens in Autumn and Winter*, under ASTRONOMY; also section *The Stars and Their Names*. F.B.L.

PLEIONE, *ple' o ne.* See PLEIADES.

PLEISTOCENE, *plise' toh seen*, **EPOCH.** See GLACIAL EPOCH.

PLENIPOTENTIARIES. See DIPLOMACY

PLEURA, *plu' rah*, THE, a double sac of thin, watery (serous) membrane. The inner bag, called the *pulmonary pleura*, covers the lung, the other, the *parietal pleura*, lines the cavity of the chest, the *thorax*. When in a healthful condition, the two sacs touch each other, and a fluid, as in other serous membranes, moistens them continually, thus the motion of the lungs against the thorax in breathing is smooth and painless. There is a pleura for each lung.

Although the two layers of the pleura do touch one another, still there is a potential space between them, known as the *pleural cavity*. This pleural cavity is most important in giving the lungs the characteristics with which we are familiar. In this potential cavity there exists a negative pressure which continually exerts a pressure outward on the lungs, and so keeps them expanded. The lungs themselves are entirely passive organs; that is, they make no motions of their own accord. In respiration, it is the increase of negative pressure in the pleural cavity, owing to the increase in size of the chest, that causes the lungs to expand and fill with air. In expiration, the air is squeezed out of the lungs, owing to the diminished size of the chest.

In certain diseased conditions, the pleural cavity may lose its negative pressure. Then, because there is nothing to keep the lungs expanded, they collapse and are no longer capable of filling with air. This condition may occur whenever anything pierces the chest and allows the outside air to enter, such as a bullet wound. The pleural cavity sometimes becomes an actual cavity through filling with fluid or blood. Such a condition is very serious.

There are two pleurae, the right and left. They touch at the middle of the *sternum*, or breastbone, and so form a wall for the other organs of the chest. Inflammation of the pleura causes the disease known as pleurisy. See PLEURISY; LUNGS; MEMBRANES. K.A.E.

PLEURAL CAVITY. See PLEURA, THE.

PLEURISY, inflammation of the serous membrane that lines the inside of the chest and covers the lungs (see PLEURA, THE; LUNGS). In health, these two surfaces of the membrane, being smooth and moist, glide over each other with every breath we take, without any perceptible movement. When the pleura is inflamed, the surfaces become dry and rough and rub together, causing intense pain in the side. Chills and fever, difficult breathing, and a short, dry cough are all characteristic symptoms of an attack of pleurisy. In a few hours a small quantity of fluid is poured out in the pleural sac, which, in favorable cases, relieves pain and is absorbed. Sometimes, however, the effusion is so large as to compress the lung. Physicians usually distinguish these forms as dry pleurisy and pleurisy with effusion

An attack of dry pleurisy is treated by rest in bed, hot baths, the application of a mustard plaster, and strapping the chest to limit the breathing movements. Pleurisy with effusion sometimes requires the operation of tapping the chest to draw off the fluid. In most cases a physician should be called at once. The malady is often the result of exposure to cold, but sometimes it occurs as a complication of pneumonia, tuberculosis, and various other infectious diseases. W.A.E.

PLINY, *plin' ie*, the family name of two distinguished Roman writers, uncle and nephew, known as THE ELDER and THE YOUNGER.

Pliny the Elder, whose name in Latin is GAIUS PLINIUS SECUNDUS, was born in A D 23 and died in 79, during the famous eruption of Mount Vesuvius (which see) From Northern Italy, where he was born, he went to Rome while but a boy, and because he came of a wealthy family, received the best education the city afforded As a soldier in the wars with the Germans, he distinguished himself, but his attempts to practice law were unsuccessful, and he withdrew to his estates at Novum Comum. In 71 he was in Spain as procurator, and on returning to Rome, two years later, he adopted his nephew, who became known as Pliny the Younger. Under the Emperor Vespasian, Pliny's personal friend, he received various offices and commissions.

Whether at home or traveling from place to place, Pliny never ceased his systematic studies, but read constantly, and his fund of information became the

marvel of later ages. In 79 he was in command of the Roman fleet, close enough to see the eruption of Vesuvius which destroyed Pompeii and Herculaneum; and anxious to observe the effects as closely as possible, he landed at Stabiae There he met death from the vapors following the eruption His nephew describes his death in two letters to Tacitus.

His One Important Work Pliny wrote, in thirty-one books, a continuation of an earlier history of Rome, and various other works; but the only one which survives is his *Natural History*. This was compiled from the notes which he made from readings and observations, and includes not only botany and zoology, but geography, astronomy, and meteorology. It has no great scientific merit, but contains much information on ancient life and ideas which is not elsewhere available.

Pliny the Younger (62- ?), whose name in full was GAIUS PLINIUS CAECILIUS SECUNDUS, was born at Novum Comum. When but nine years old, he lost his father, and two years later he was adopted by his uncle (see above). He had excellent educational advantages, and made such good use of them that before his twentieth year he was known as one of the most learned men of the time. He studied under Quintilian, was a popular orator, and held a number of offices, serving in succession as military tribune, quaestor, praetor, and consul The last known date in his life is 103, the year in which he was made propraetor of Bithynia, when he died is not known, though it is probable that he lived at least ten years after that time Besides his eulogy of the Emperor Trajan, nothing of his writings remains except his letters, which give interesting pictures of the life of the times

PLIOCENE, *pli' o seen*, **EPOCH,** the closing epoch of the Tertiary Period, succeeding the Miocene Epoch The name, which is from the Greek, means *more recent*. Some geologists rank the Pliocene as a period. The epoch was characterized by great extension of the land area, so that all the continents except Australia and Antarctica became joined in a single huge land mass, and the seas were restricted to the deeper basins. Hence Pliocene rocks are largely terrestrial sediments, though marine Pliocene strata are found in some regions. Many beds are rich in fossils, and they are of especial importance as they contain the remains of the immediate ancestors of the present groups of mammals. What are regarded by some geologists as the oldest traces of early man yet discovered were found in beds of Pliocene age. See GEOLOGY. L.LaF.



THE RING PLOVER AND ITS FOOD

Related Subjects. The reader is referred in these volumes to the following articles

Cenozoic Era
Geology (Divisions of Time)
Tertiary Period
Glacial Epoch
Miocene Epoch

PLOVER, *pluv' ur*, one of a large family of shore birds found in almost every part of the world. Many of them are tide birds, living in marshy places and on coasts where they pick up the small bits of food washed in by the tide. Species common in North America include the *black-bellied plover*, a bird with black breast, legs, head, and bill, and spotted black and white back; the *golden plover*, much like the black-bellied, but having golden-yellow spots on its back; and the *ring plover*, characterized by a circle of white around the throat. These three plovers, and a few others, live inland through the summer months, and during that time are much-prized game birds. Their bodies, about twelve inches long, are rounded, and their wings, which are long and strong, are adapted to long-distance flights.

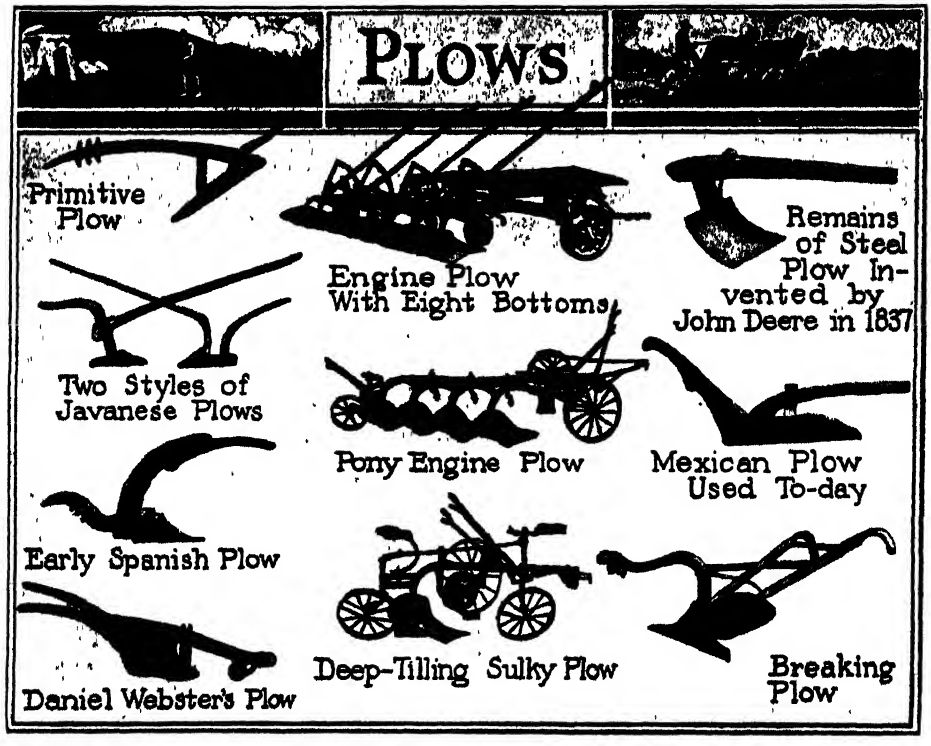
The golden plover, which of all the family has the greatest range, breeds in the Arctic regions, and in winter migrates as far south as Patagonia, in South America. The female, after laying four creamy-white, chocolate-marked eggs in her very crude nest, flies away and allows the father to hatch the eggs. These plovers feed on insects and worms, and are especially fond of grasshoppers.

The black-bellied plovers are very distrustful of people, and are constantly finding cause to excite a whole neighborhood of birds with their warning cries. Their nests are mere hollows in the ground, sometimes quite bare, sometimes lined with a bit of dry grass. When the nest is approached, the mother bird flies off and limps along the ground, dragging a wing in order to attract attention to herself and away from her eggs. D.L.

[The killdeer, described elsewhere under that title, is the most common American plover The so-called *upland plover* is a *sandpiper*. For a description of the *crested plover* of Europe, see the article LAPWING.]

Scientific Names. The plover family is known as *Charadriidae*. The black-bellied plover is *Charadrius squatarola*; the golden is *C. dominicus*; the ring is *Aegialitis semipalmata*.

PLOW, the basic tillage implement. When man first began to prepare the soil for seed, he used a stick to dig up the ground. Later, realizing that more soil could be turned up with a more elaborate tool, he broke off a forked limb from a tree, sharpened one prong, and used the other for hitching, while the main branch served as a handle. This was the first plow. Originally, a fellow tribesman or two may have dragged the implement over the ground; but later, oxen were used. In some



parts of the world to-day, plowmen are tilling the soil with implements almost as crude, drawn by oxen or camels.

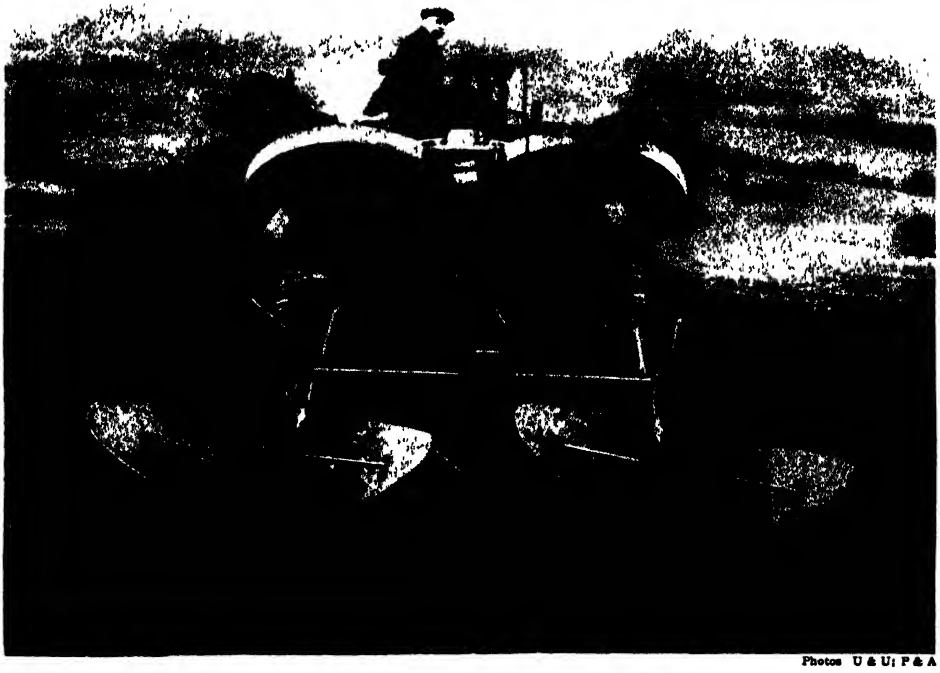
It is a far cry from the forked stick to the modern plow, but the degree of perfection in the plows of to-day has been reached only through centuries of study and invention. H. C. Ramsower, in *Equipment for Farm and Farmstead*, says: "More effort has been expended in the slow process of development of this seemingly simple tool than in that of any other implement on the farm."

In this progress, America in the last two centuries has taken the lead, and there are now made more than a thousand patterns of plows, each adapted to the special needs of the locality in which it is to be used, or to the preparation of the soil for a special crop. For tilling a small plot, the *walking* plow is a serviceable implement. This turns but one furrow and can be hauled by a team of horses or a yoke of oxen. Its name refers to the fact that the plowman walks behind the implement and keeps it in position by grasping the handles. These are attached to the beam, the part by which the plow is drawn. The working part of the implement, which is called the bottom, is made up of the frame, or frog, and the moldboard, the share, and the landside, the last three parts being mounted on the frog.

Wood, steel, and iron are the materials used, but in the best plows, only the handles are of wood. When the beam is of wood, the frog is usually made of cast iron, a material that gives the frame strength and rigidity. The moldboard, share, and landside are made either of chilled iron or soft-center steel. The former material is very hard and durable, but is heavy and subject to fracture if struck suddenly. Plows of soft-center steel are light and cannot be broken easily. They need protection from the weather, however, and in gravelly or sandy soil are not so durable as chilled-iron plows. Generally speaking, steel is in much wider use for plows than iron, but iron plows are more serviceable for some localities.

The purpose of the moldboard is to lift, turn, and pulverize the furrow slice. It varies in shape according to the type of soil to be broken. The *sod* moldboard is long and gently sloping, and has a good deal of a twist. The *stubble* type is short and steep, and has a very abrupt curvature. It is used on land requiring a considerable degree of fining or pulverizing. The *general-purpose* type, intermediate between the other two, is used on farms where there is a light turf to break, but little virgin land. For stiff virgin prairie soil, the best type is the *breaker* moldboard, which is very





Photos U & U; P & A

Two Modern Plows. Above, a caterpillar tractor pulling a gang plow with a plowing range of twelve and one-half feet. Below, an English rotary plow, embodying an entirely new principle. Two sets of rotating cutters break up the soil, to a depth of eighteen inches, if desired. The illustration shows a rear view, with the cutters raised for inspection.

long and has a gradual curvature. There are variations of all of these types.

The share is the cutting edge of the plow. Steel shares are more expensive to buy than chilled-iron ones, but are an economy in the end because they may be sharpened by a competent blacksmith and made to last several years by such renewal.

The landside is a sidepiece opposite the moldboard, making a V-shaped point with the lower front end of the share. By pressing against the side of the furrow, the landside offsets the side pressure exerted on the moldboard by the slice. Not only does it ease the strain, but it helps to steady the motion of the plow. Coulters and jointers are cutting attachments commonly used to ensure a clean-cut furrow. They are attached to the beam and cut the sward ahead of the share. The coulter is a knife or blade of varying form. The jointer is a small shovel-like plow. It is almost indispensable on stubborn sod land

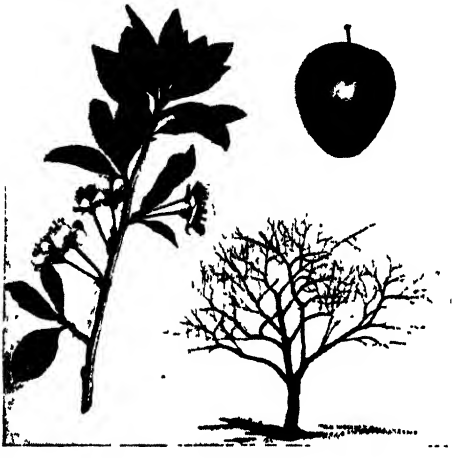
Riding, or *sulky*, plows are in general use on large farms. Some of these plows have two, three, or four moldboards, one turning two furrows can be operated successfully with four horses or mules These plows commonly have three wheels; one runs in the open furrow just ahead of the first bottom, another runs in the furrow just back of the last bottom, and the third runs on the unplowed land. The depth of the furrow is regulated by levers operated by the driver. Plows turning more than two furrows require proportionately more power, and gasoline or oil tractors or traction engines are used to operate them. Gang plows turning fifty-four furrows are now in use on some of the largest wheat farms. It requires three traction engines to operate one of these gangs, and it will plow an acre in a few minutes.

All of the plows referred to above are of the moldboard type. An implement of wholly different construction is the *disk* plow, in which the furrow is turned by a rolling concave blade two feet or more in diameter. The disk plow cuts a furrow eight to twelve inches wide, and is especially useful for plowing hard or sticky soil or stony land. It will not plow tough sod land satisfactorily. F.W.D.

PLOW, SONG OF THE. See AGRICULTURE.

PLUM, a widely cultivated orchard fruit, closely related to the peach. Unlike the peach, however, the plum has a smooth coat and an unwrinkled pit. The ripe fruits show varying shades of purple, red, green, and yellow, and they also have a wide range in size. The yellow Burbank plums are nearly as large as a peach; the ordinary purple varieties are sometimes as large as an egg; and some of the wild red plums are not much larger than a cherry. Plums are eaten fresh, dried and marketed as prunes (which see), canned, preserved, made into a delicious butter, and into jams and jelly. They are among the most nutritious of orchard fruits; their percentage of carbohydrates is 20.1, as compared with 9.4 for peaches, 14.1 for pears, and 16.7 for cherries.

Distribution and Kinds. There are three main classes of cultivated plums, all of which are grown in America; these are the *European*, the *Japanese*, and the *American*. The *common European plum* (*Prunus domestica*), native to Eastern Europe and West-Central Asia,



THE PLUM

Form of the tree, as seen during the winter, a branch, with the leaves and flowers of spring, the ripened fruit of early autumn

was the first to receive attention from American fruit-growers. Varieties of this species are cultivated especially in New York, the New England states, and in the Pacific-coast region. These plums are not very hardy, and cannot be grown in moist sections of the South, because of susceptibility to brown rot. This disease is less a menace under dry atmospheric conditions. Another European-Asian species (*P. insititia*), called the *Bullace plum*, is cultivated particularly in the Northeastern states as a cooking and preserving fruit. Varieties of this species are commonly known as *Damsons*.

Of more recent development are varieties of the Japanese species (*P. salicina* or *triflora*). These plums are grown in New England and on the Pacific coast, and also in the South and interior regions. Several native American species have been developed by horticulturists. These are better adapted to the prairie and colder northern regions than the imported plums, and are also more resistant to summer heat and to diseases. They are widely distributed in the United States and Canada. The *horse plum* (*P. americana*) is one of the most important of the native plums. It is

found generally in the United States and Canada east of the Rocky Mountains. Other species include the *Canada plum* (*P. nigra*), a hardy sort that withstands the severe cold of the Northern states and Canadian provinces; the *hortulana* (*P hortulana*), important in the Mississippi Valley; and the *beach plum* (*P. maritima*), of the Atlantic-coast states.

Plums are grown in practically every state of the Union, and the annual yield for the whole country (including prunes) is between 15,000,000 and 20,000,000 bushels Among orchard fruits they rank third, following apples and peaches. Leading states, in amount of crop, are California, Oregon, Washington, Pennsylvania, New York, Idaho, Missouri, Texas, Ohio, and Michigan, in varying order except in case of the first three states

Culture. Varieties of plums are commonly propagated by budding young shoots grown from seed [see GRAFTING (Bud Grafting)] Trees are usually set in the orchards twenty feet apart each way, though large-sized varieties may require more space. Two-year-old nursery trees are suitable for transplanting in the North, and one-year-old trees in less rigorous sections. Clean cultivation of the orchard soil, pruning, and control of insects and diseases are practiced, as in the culture of other orchard fruits The plum curculio, a snout beetle prevalent east of the Rocky Mountains, is the worst insect pest of plums (see CURCULIO) Lead arsenate is used to check it.

Plums for shipment to outside markets are usually picked before they are fully ripe, and the farther away the destination, the greener must the fruits be All jelly plums, too, must be picked while still green It is very important that plums for shipment be packed carefully and that they be perfectly dry when placed in the containers. Dampness is almost sure to cause loss of fruit through dry rot, a fungous disease B.M.D.

PLUMB, *plum.* See PLUMMET.

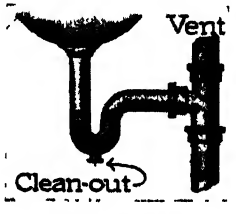
PLUMBAGO, *plum ba' go* See GRAPHITE

PLUMBING, *plum' ing.* There are few things about which the average man knows so little, and about which, if he is a householder, he should know so much, as plumbing. Knowledge of its principles is particularly necessary in smaller communities, where plumbers are likely to be out of touch with the rapid progress of sanitary science. But it is helpful anywhere, especially in judging whether a plumber is installing unnecessarily expensive work, or is omitting wise steps to save money for himself. Most cities have printed regulations concerning the vital points, and, although these are not infallible, in the larger cities they usually embody correct ideas; a copy of them would be valuable to anyone having plumbing work done.

Modern plumbing fixtures, especially those for the bathroom, are often admired for their beauty, but their cleanliness is what really gives them value. The old-fashioned marble washbowl which collects dirty waste in its joints and corners; the sheathed-in bathtub which gathers dust and dirt around its edges; the kitchen sink built of more or less porous materials which absorb grease and dirty water —all are insanitary, but nothing cleaner can be imagined than the smooth, non-absorbent, and cornerless fixtures it is now possible to secure.

More important, however, than the visible details of plumbing are its concealed portions. Here the thing to guard against is the escape of sewer gas, coming either from the sewer outside the house or from the drainage pipes within. Every householder should understand how a *trap* operates, for it is in respect to traps that careless or ignorant plumbers make the most serious mistakes.

The commonest trap is the half S-trap, one form of which is shown in the illustration. Since it depends for its efficiency upon the presence of water, every precaution should be taken to prevent the exhaustion of its contents. The chief danger is from siphoning (see SIPHON), which will draw out all the water if a vacuum is formed in the waste pipe To prevent this there should always be a vent, unless a siphon-proof trap is used. There are a few such traps approved by plumbing inspectors, but many others are falsely so-called. Venting adds very much to the expense of plumbing, but is too important to neglect. The second danger to a trap is that its seal may be forced out by pressure of gases in the sewer, but this is not liable to occur if the vertical stacks (main drainage pipes) end above the roof. A third danger, from evaporation, is present only when a fixture is seldom used



THE HALF S-TRAP

The water in it is called the seal, because no gas can escape through it

Every fixture, even an ice box, should have a trap. Because it contains food, an ice box should be specially protected by having two traps with an open drip pan between. But there should never be two traps in succession without the intermediate opening, for what is called an air lock will eventually prevent drainage through the pipes. Where a bathtub or other fixture has an overflow outlet, this must never be connected to the sewer side of the trap Each trap should have an accessible clean-out, but this should be on the under side, where, if it is leaky, no gas can escape. Main traps, at the point where the drain leaves the

house, are omitted in some cities in order to give ventilation to the general sewer, but the omission is opposed by many sanitary engineers because it may cause the gases of the sewer to be forced out when there is a leak in the household pipes, or whenever a fixture trap is removed or opened for cleaning. A main trap, if installed, must have a fresh-air inlet.

Testing for Leaks. The tests required by plumbing inspectors in cities should be performed wherever possible. The commonest are the water test for new houses, and the smoke and peppermint tests for old ones. Each test is made twice—first, when only the rough plumbing is in place; afterward, when all the fixtures are installed. In the first, of course, all ends of pipes are plugged; in the second, all traps are given a seal. The water test consists in filling the system with water, gradually, so that leaks may be discovered as soon as they occur, then allowing the water to stand several hours. In the smoke test, heavy black smoke is introduced into the pipes and air pressure then applied. The peppermint test depends upon the penetrating odor of two ounces of oil of peppermint mixed into a gallon of hot water. This is not so reliable as the smoke test. C.A.C.

PLUMCOT. See BURBANK, LUTHER.

PLUM CURCULIO, *kur ku' lih o.* See CURCULIO.

PLUMMET, *plum' et,* a weight let down at the end of a cord to sound the depth of water or of excavations, or to regulate work such as measuring, by keeping it *plumb*, or in a straight line. In building a wall, the plummet is constantly used by masons. It usually consists of a line fastened to a narrow board at one end, and at the other end to an egg-shaped piece of lead. The weight of the lead keeps the line straight, giving an accurate measure for maintaining the perpendicular. If used near a range of mountains, the plummet is found to be incorrect, the attraction of the mass of mountain drawing the metal weight slightly out of line. The difference caused by this attraction, while slight, would be sufficient to throw a high wall quite out of the perpendicular. The attraction, therefore, in such cases has to be allowed for, that the building line may be kept accurate. It is also stated that on the seacoast the ebb and flow of the tide have a direct influence on the plummet. See GRAVITATION.

PLUMULE, *ploo' mule.* See COTYLEDON; GERMINATION.

PLURALS, FORMATION OF. See NUMBER.

PLUSH, a pile fabric similar to velvet, but with a longer, softer nap. The nap was formerly always of mohair, the hair of the angora goat, but silk is now commonly used. Worsted plush with mohair nap is used in making cloaks, caps, hats, and other articles of wearing apparel. Plush with a silk nap is used for men's silk hats, for women's coats, and in upholstery. In Europe plush is extensively used for breeches worn by footmen, and for this purpose is made in a variety of colors. London and Lyons are particularly noted for the manufacture of plush. See VELVET.

PLUTARCH, *ploo' tahrk* (about A.D. 46–about 125), a Greek biographer and essayist, author of a series of lives of great men that has become a classic. He was born at Chaeronea, in Boeotia, near the homes of Hesiod and Pindar, and was educated at Athens and by travel through Greece, Italy, and Egypt. In these countries he apparently had access to numerous libraries and records. In his old age, Plutarch was the religious or ethical guide of a large number of young men, and was considered one of the most entertaining talkers of his day.

His *Parallel Lives of Illustrious Greeks and Romans*, commonly referred to to-day as *Plutarch's Lives*, were written generally in pairs, one Greek and one Roman, and are famous as models of intimate, living biography. In the Middle Ages they were the inspiration of innumerable tales, romances, poems, and treatises, and they were used by Shakespeare and other Elizabethan dramatists. To-day, they are regarded as an important source of our knowledge of antiquity. In them is to be found some of the most serious work in ancient literature. They are not rendered dull by severe scholarship, but are keen character sketches, each offering a lesson in public morality and honesty. Because of their influence over many famous men, the *Lives* have been called "the food of great souls."

Plutarch's other writings, *Moralia*, consisting of philosophical and ethical discussions, are quaint and pleasant, but not important Many of these are in the form of dialogues and discuss, in the light manner of "table talk" of that day, such topics as "How a Young Man Ought to Read Poetry," "Rules for the Care of Health," and "Advice to the Married."

PLUTO, *ploo' toh*, also called HADES, ORCUS, or DIS, in Greek mythology, was the ruler of the lower world. He was the brother of Jupiter and Neptune, and the portion of the universe which fell to his lot well suited his gloomy disposition. As the thunderbolt is attributed to Jupiter and the trident to Neptune, so to Pluto belongs the helmet of invisibility, the gift of the Cyclopes. His palace was within the earth—a dark and dreary place, to which, sooner or later, all mankind came. The god was not really cruel, but he was very jealous of his power, and since he never yielded to petitions to allow the dead to return to earth, he became an object of detestation to all men. Few temples were erected to him, though all feared him so much that they dared not refuse to worship him. That with all his

severity Pluto was capable of affection, and longed for it in return, is shown by the story of Proserpina, whom he carried off to be his queen. Since gold, silver, and the other metals were found hidden in the earth, Pluto was regarded as the god of riches, but there was a special god who personified wealth, named Plutus. Our word *plutocrat* may be traced to the Greek word for *wealth*.

Related Subjects. The reader is referred in these volumes to the following articles:

Cerberus	Jupiter	Plutus
Hades	Neptune	Proserpina

PLUTUS, *ploo' tus*, in Greek mythology, the god of wealth. He was the son of Iasion (Jason) and of Demeter (Ceres), goddess of agriculture. Because he bestowed his gift of wealth only on the good and noble, Zeus struck him blind so that none should be favored, but good and bad alike receive riches. In art Plutus is usually represented as a child held in the arms of a goddess, especially Pax, the goddess of peace, who befriended him when he was deserted by his parents. See the article PLUTO.



Down to the Plymouth Rock, that had been to their feet as a doorstep,
Into a world unknown,—the corner stone of a nation!
—LONGFELLOW *Courtship of Miles Standish.*

PLYMOUTH, *plim' uth*, ENGLAND. See ENGLAND (The Cities).

PLYMOUTH, MASS. See MASSACHUSETTS (back of map).

PLYMOUTH, PA. See PENNSYLVANIA (back of map).

PLYMOUTH COLONY, next to Jamestown, the oldest permanent English settlement in America. It was founded in 1620 at Plymouth, in what is now Massachusetts, by a body of English Separatists, whom Governor Bradford was wont to speak of as "pilgrims upon the earth." Part of the original company of Pilgrims sailed in "the small ship" *Speedwell* from Leyden, Holland, whither they had fled twelve years before, to escape from persecution in England. At Southampton, they found "the bigger ship" *Mayflower*, "come from London with all the rest of their company." The *Speedwell* was declared to be unseaworthy, and was left at Plymouth, England, from which port the *Mayflower* finally sailed on September 6, 1620 (see subhead below). After a stormy voyage of nine weeks, the voyagers sighted Cape Cod on November 9. It was by accident that the Pilgrims reached this part of the country, for they had planned to settle near the mouth of the Hudson, within the jurisdiction of the London Company.

While their little ship was rocking in the harbor, the "Pilgrim Fathers" met in its cabin and swore loyalty and obedience to the government they had framed (see *Mayflower Compact*, below). After exploring the coast for several weeks, they landed at Plymouth Rock, December 21, 1620.

"Above them spread a stranger sky:
Around, the sterile plain,
The rock-bound coast rose frowning nigh;
Beyond—the wrathful main:
Chill remnants of the wintry snow
Still choked the encumbered soil,
Yet forth those Pilgrim Fathers go
To mark their future toil."

The Indians who originally occupied this shore had died of a pestilence a few years earlier, and the Pilgrims took possession of their abandoned fields. During the first year, scarcity of food, exposure, and disease caused the loss of half of their number, including their governor, John Carver. The following year, fifty more of their people came from Leyden, Holland. William Bradford, one of the noblest characters of colonial history, was chosen as the second governor, and through his guidance and courage, the perseverance and faith of the people, and the protection of the brave and able Captain Miles Standish, the colony survived and prospered. The communal system, which had been adopted during the first year, was abandoned, and a democratic government was permanently established.

The Mayflower. The vessel which carried the Pilgrims to the American coast after a stormy voyage of sixty-three days was incredibly small (180 tons) compared to the giant ocean liners with which we are familiar; the *Leviathan* and the *Majestic* are more than 310 times as large. There were on board 102 persons.

The Compact. During the voyage there was drawn up and signed, by the forty-one heads of families represented, the first instrument of civil government ever subscribed to by all the people concerned. On November 11 (new calendar) this basic law, which became known



SIGNING THE COMPACT OF THE PILGRIMS

as the *Compact of the Pilgrims*, was solemnly accepted by the entire number as their principle of government in the great experiment



CANOPY ERECTED OVER PLYMOUTH ROCK

on which they had embarked. In form, the following is an exact copy of the document:

In ye name of God, Amen We whose names are underwritten, the loyall subjects of our dread soveraigne Lord, King James, by ye Grace of God of Great Britaine, France & Ireland King, Defender of ye Faith, etc Haveing undertaken, for ye Glorie of God, and advancemente of ye Christian Faith and Honour of our King and countrie, a Voyage to plant ye first Colonie in ye Northerne part of Virginia, doe by these presents solemnly and mutually in ye Presence of God, and of another, Covenant & Combine our selves togeather into a Civill body Politick, for our better Ordering & Preservation & Furtherance of ye ends aforesaid, and by Vertue hereof to enact, constitute, and frame such just & equall lawes, ordinances, Acts, Constitutions & Offices, from Time to Time, as shall be thought most meete & convenient for ye generall good of ye Colonie, unto which we promise all due submission and obedience.

The Honored 102. William Bradford, second governor of Plymouth, wrote a voluminous history of the *Mayflower* adventure. He gave a list of the passengers, and after thirty years added an appendix which accounted for each person after that lapse of time. The names of those on the *Mayflower* he recorded as follows:

The names of those which came over first, in ye year 1620 and were by the blessing of God the first beginers and (in a sort) the foundation of all the Plantations and Colonies in New-England; and their families.

Mr. John Carver; Kathrine, his wife; Desire Minter; & 2. man-servants, John Howland, Roger Wilder, William Latham, a boy; & a maid servant, & a child yt was put to him, called Jasper More.

Mr William Brewster; Mary, his wife, with 2 sons, whose names were Love & Wrasling, and a boy was put to him called Richard More; and another of his brothers. The rest of his children were left behind, & came over afterwards.

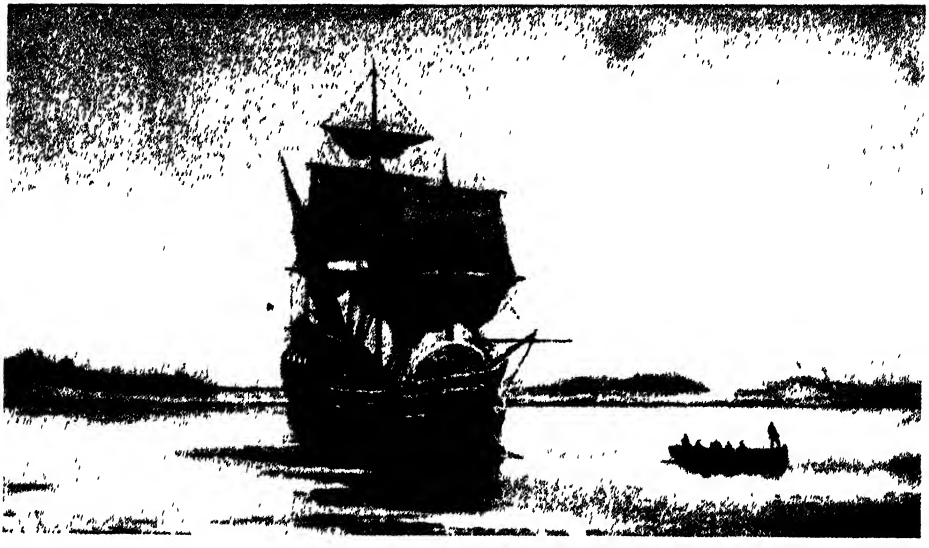
Mr. Edward Winslow; Elizabeth, his wife; & 2. men servants, caled Georg Sowle and Elias Story; also a little girle was put to him caled Ellen, the sister of Richard More.

William Bradford, and Dorothy, his wife; having but one child, a sone, left behind, who came afterward.



Photo: A. S. Burbank, Plymouth, Mass.

Pilgrims at Prayer on the Evening of Embarkation at Delftshaven. There was rare courage in the pious group of Puritans that knelt on the deck of the little vessel that was to venture into a new world. [From the painting by Weir, now in the Capitol, Washington, D. C.]



THE "MAYFLOWER" IN PLYMOUTH HARBOR
[From the painting by Holsall]

Mr. Isaack Allerton, and Mary, his wife; with 3. children, Bartholmew, Remember, & Mary; and a servant boy, John Hooke.

Mr. Samuell Fuller, and a servant, caled William Butten. His wife was left behind, & a child, which came afterwards.

John Crakston, and his sone, John Crakston.

Captin Myles Standish, and Rose, his wife.

Mr Christopher Martin, and his wife, and 2. servants, who were Salomon Prower and John Langemore.

Mr. William Mullines, and his wife, and 2. children, Joseph & Priscila, and a servant, Robart Carter.

Mr. William White, and Susana, his wife, and one sone, caled Resolved, and one borne a shipbord, caled Peregriene; & 2. servants, named William Holbeck & Edward Thomson.

Mr. Steven Hopkins, & Elizabeth, his wife, and 2. children, caled Giles, and Constanta, a doughter, both by a former wife; and 2. more by this wife, caled Damaris & Oceanus; the last was borne at sea; and 2. servants, caled Edward Doty and Edward Litster.



"LAND OF THE PILGRIMS' PRIDE"

Part of Plymouth in 1622. From the lower left hand corner the buildings, in order, were the storehouse and the residences of P Brown, J. Goodman, William Brewster, and J. Billington; beyond these, the identity of the occupants in that line of houses is not known. Across the street within the stockade was the home of Governor Carver. The picture is from a painting by W. L. Williams.



Photo: Visual Education Service

RETURN OF THE "MAYFLOWER" TO ENGLAND

Governor Bradford, in his *History of Plimouth Plantation*, said of those who chose to remain in America, "There was the mighty ocean which they had passed, and was now as a maine barr & goulfe to separate them from all the civill parts of the world."

Mr. Richard Warren; but his wife and children were lefte behind, and came afterwards

John Billinton, and Elen, his wife, and 2. sones, John & Francis

Edward Tillie, and Ann, his wife; and 2. children that were their cossens, Henery Samson and Humillity Coper.

John Tillie, and his wife; and Eelizabeth, their doughter.

Francis Cooke, and his sone John. But his wife & other children came afterwards.

Thomas Rogers, and Joseph. his sone. His other children came afterwards.

Thomas Tinker, and his wife, and a sone.

John Rigdale, and Alice, his wife.

James Chilton, and his wife, and Mary, their dougter. They had an other doughter, yt was married, came afterwards.

Edward Fuller, and his wife, and Samuell, their sonne.

John Turner, and 2. sones. He had a doughter came some years after to Salem, wher she is now living.

Francis Eaton, and Sarah, his wife, and Samuell, their sone, a yong child.

Moyses Fletcher, John Goodman, Thomas Williams, Digerie Preist, Edmond Margeson, Peter Browne, Richard Britterige, Richard Clarke, Richard Gardenar, Gilbart Winslow.

John Alden was hired for a cooper, at South-Hampton, wher the ship victuled; and being a hopfull yong man, was much desired, but left to his owne liking to go or stay when he came here; but he stayed, and maryed here.

John Allerton and Thomas Enlish were both hired, the later to goe mr of a shalop here, and ye other was reputed as one of ye company, but was to go back (being a seaman) for the help of others behind. But they both dyed here, before the shipe returned.

There were allso other 2 seamen hired to stay a year here in the country, William Trevore, and one Ely. But when their time was out, they both returned.

These, bening aboute a hundred sowls, came over in this first ship, and began this worke, which God of his goodnes hath hithertoo blesed, let his holy name have ye praise.

Related Subjects. In connection with a study of Plymouth Colony, the following articles in these volumes will be found interesting

Alden, John	Pilgrims
Bradford, William	Plymouth, Mass.
Carver, John	(back of state map)
Courtship of Miles Standish	Plymouth Company
London Company	Plymouth Rock
Massachusetts (History)	Puritans
Massachusetts Bay Company	Standish, Miles

PLYMOUTH COMPANY, in American history, an English colonization and trading company, incorporated in 1606 under a charter granted by James I. This company, which was composed of Plymouth and Bristol merchants, was formed at the same time as the London Company. The king granted to the Plymouth Company colonization rights in America between latitudes 41° and 45°, but the grant was to be extended south to latitude 38° if

the colony should be planted before the London Company established one. The exact limits of the grant cannot be stated positively. The relations of the company to the king were defined by the charter, which provided that the lands colonized were to be held free of any military or other service to the king, but that the Crown should receive a fifth part of whatever precious metals were found. The appointment of the governing councils lay with the king, but settlers were guaranteed the rights and privileges of English citizens.

In 1607 the company made an unsuccessful attempt to plant a colony in Maine, near the mouth of the Kennebec River. A new company, known as the Council for New England, was formed in 1620, but this organization relinquished its powers to the king in 1635. The colony established at Plymouth in 1620 was an independent venture, and had no connection with the original Plymouth Company.

Related Subjects. See, in this connection, PLYMOUTH COLONY; PILGRIMS; also titles there suggested.

PLYMOUTH ROCK, a huge granite boulder on the ocean shore at Plymouth Harbor, Mass. When the *Mayflower* reached America on December 21, 1620, the Pilgrims disembarked on this rock. In 1774, when it was raised to be consecrated to liberty, it split into two pieces, an incident which was regarded as an omen of the separation of the colonies from England. On July 4, 1834, part of the rock was removed to Pilgrim Hall. The other half, covered with a granite canopy and surrounded by an iron fence, may still be seen in the harbor.

Related Subjects. In the articles PLYMOUTH COLONY, PILGRIMS, and PURITANS, will be found many illustrations relating to this historic stone.

PNEUMATICS, *nu mat' iks*, that branch of physics which treats of the properties of gases, either at rest or in motion. The term is little used now, though the study itself is of primary importance. As a result of the knowledge acquired about the properties of gases and the laws governing them, there have been constructed numerous tools and machines used in modern industry, all of which are based on the laws of pressure and elasticity of the air. The operations of various kinds of pumps are also based on the same principles. A.L.F.

Related Subjects. The reader is referred in these volumes to the following articles:

Air	Pneumatic Tires
Air Pump	Pneumatic Tools
Compressed Air	Pneumatic Tubes
Gas	Pump

PNEUMATIC TIRES. The invention of a tire that lessened jolting, gave greater ease in running, and reduced the weight of the machine was the greatest single factor in the popularizing of the bicycle, in the second half of the nineteenth century, and its later application to the automobile and the motorcycle made possible that great expansion of the motor industry which has so transformed modern living. The tire that brought about these results is called pneumatic because it is filled with compressed air, the name coming to us from the Greek for *wind*. As early as 1843, a patent for a pneumatic tire was taken out in England. The first one in the United States was issued in 1847. To-day, the yearly products of the pneumatic-tire industry are reported by the millions.

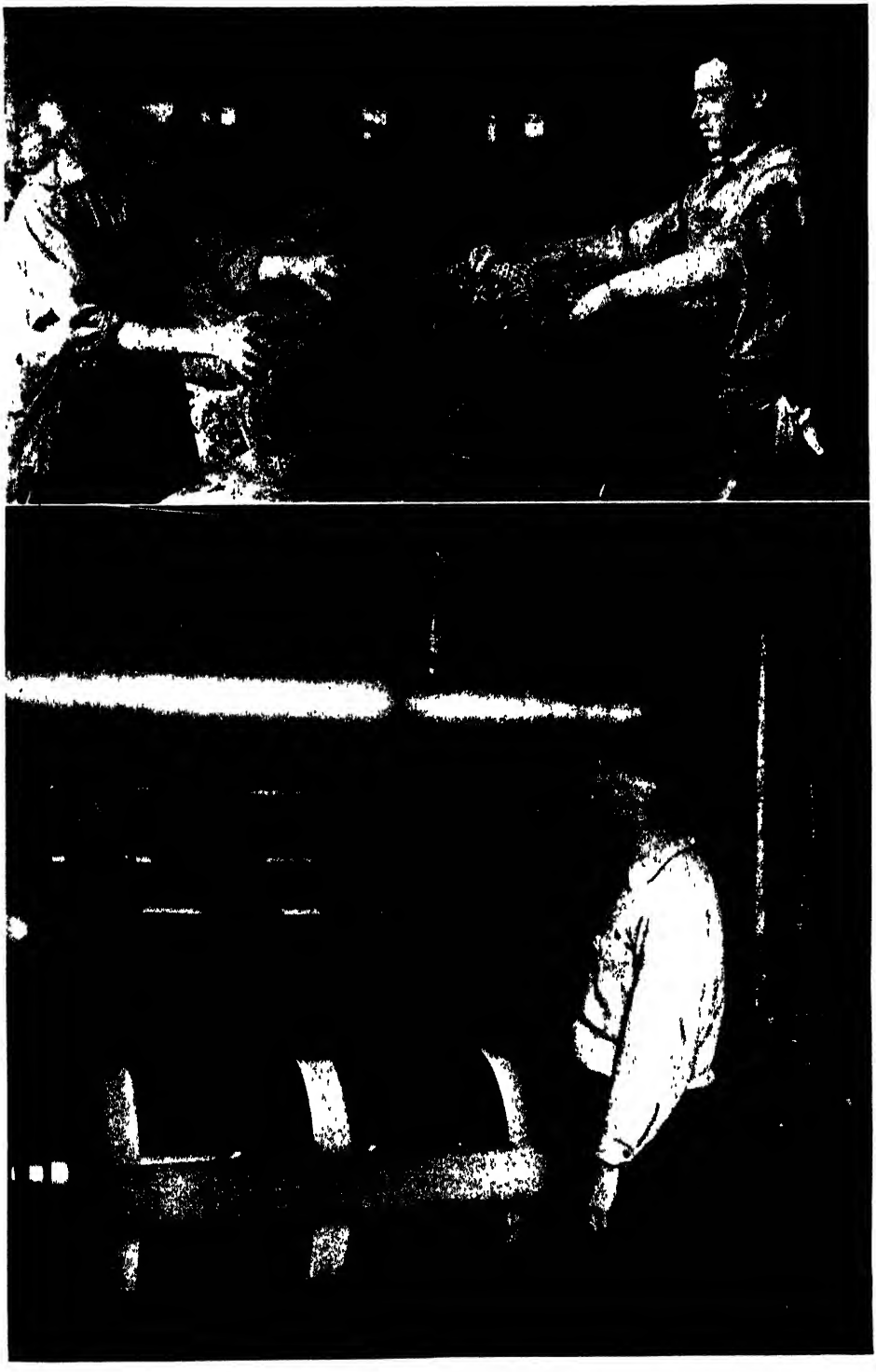
Manufacture. A pneumatic tire has two parts: an inner tube of thin rubber which is air-tight, and an outer tube or case consisting of several layers of strong fabric into which rubber has been pressed, with an outer covering of harder rubber. The rubber reaches the tire manufactories ready for use. For its preparation, see RUBBER AND RUBBER MANUFACTURE.

The Inner Tube. The sheets of rubber for the inner tube are cut into strips of the length and width necessary to make tubes of the required size. The long edges of these strips are beveled, so that they will form a smooth, strong seam. The strip is then drawn over a mandrel, and the edges are nicely fitted together and held in place by wrapping the mandrel with thin pieces of wet cloth, upon which strips of wet duck are wound spirally. The whole is then heated until the edges are cemented together. After cooling, the tube is removed from the mandrel by being turned inside out. An air valve is then inserted, and the ends of the tube are cemented together. With this last process, the tube is ready for use.

The Casing. This is the outer tube, or tire proper. Its function is to sustain the weight of the vehicle for which it is designed. The first casings were made of square-woven cotton fabric, into which rubber was pressed by mechanical power. This material was formed over a mold, and the tread was then vulcanized on its outer surface. Tires of this type were used from about 1910 to 1920. They carried air pressures ranging from fifty-five to seventy-five pounds, and gave a service of about 4,000 miles.

The limited elasticity of this tire gave rise to ply separation and fabric breaks, and caused the manufacturers to seek a fabric structure of greater resiliency. This was accomplished by the invention of the cord tire, in which the fabric consisted of parallel cords impregnated with rubber. Two plies of this fabric were used at first, but multi-ply construction soon followed. By 1920 the merits of this tire were established, and it became the standard tire of both Europe and America. The cord tire gave an average of 8,000 miles of service, and used air pressures of forty-five to sixty-five pounds.

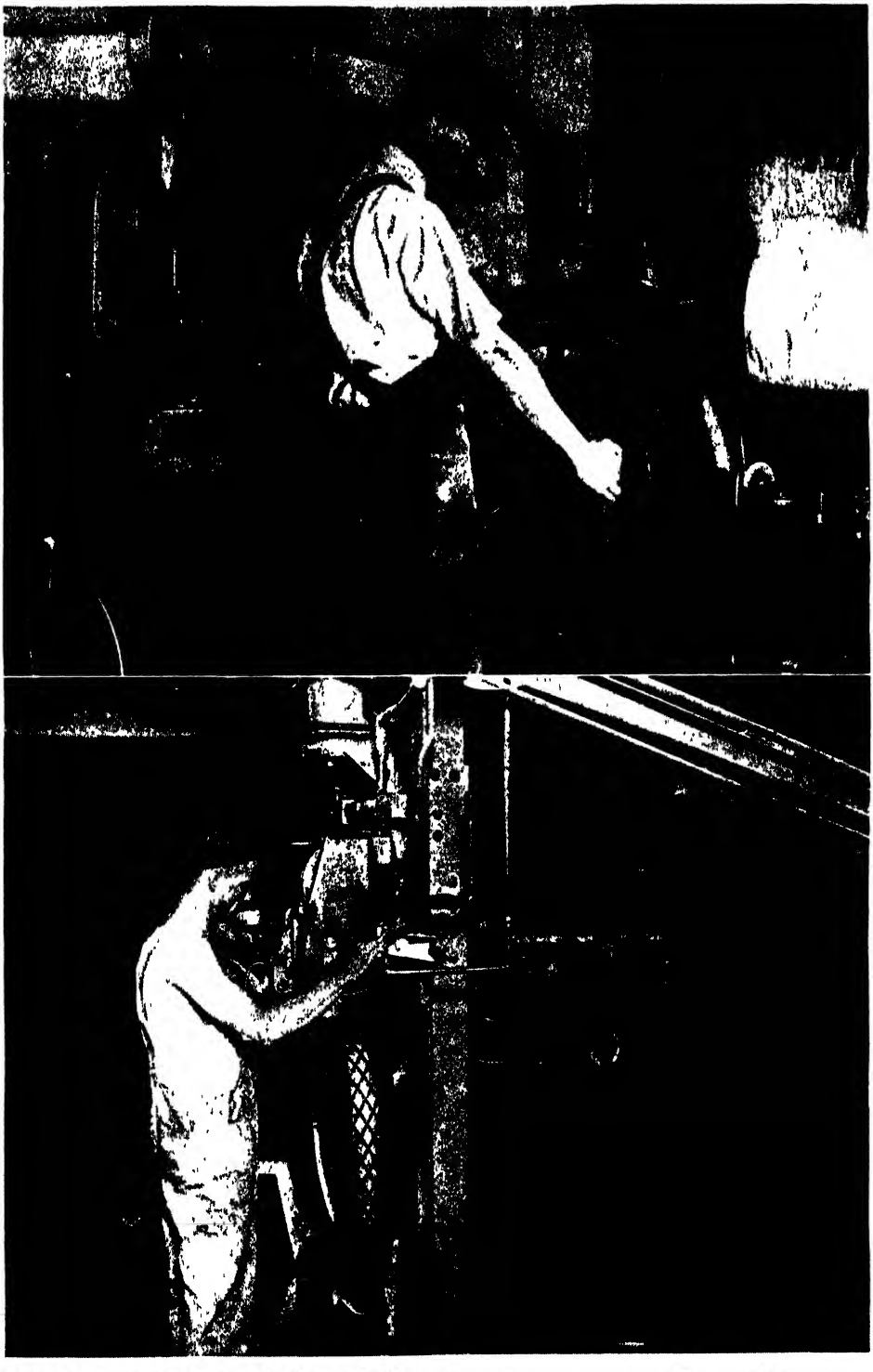
(Continued on page 5675)



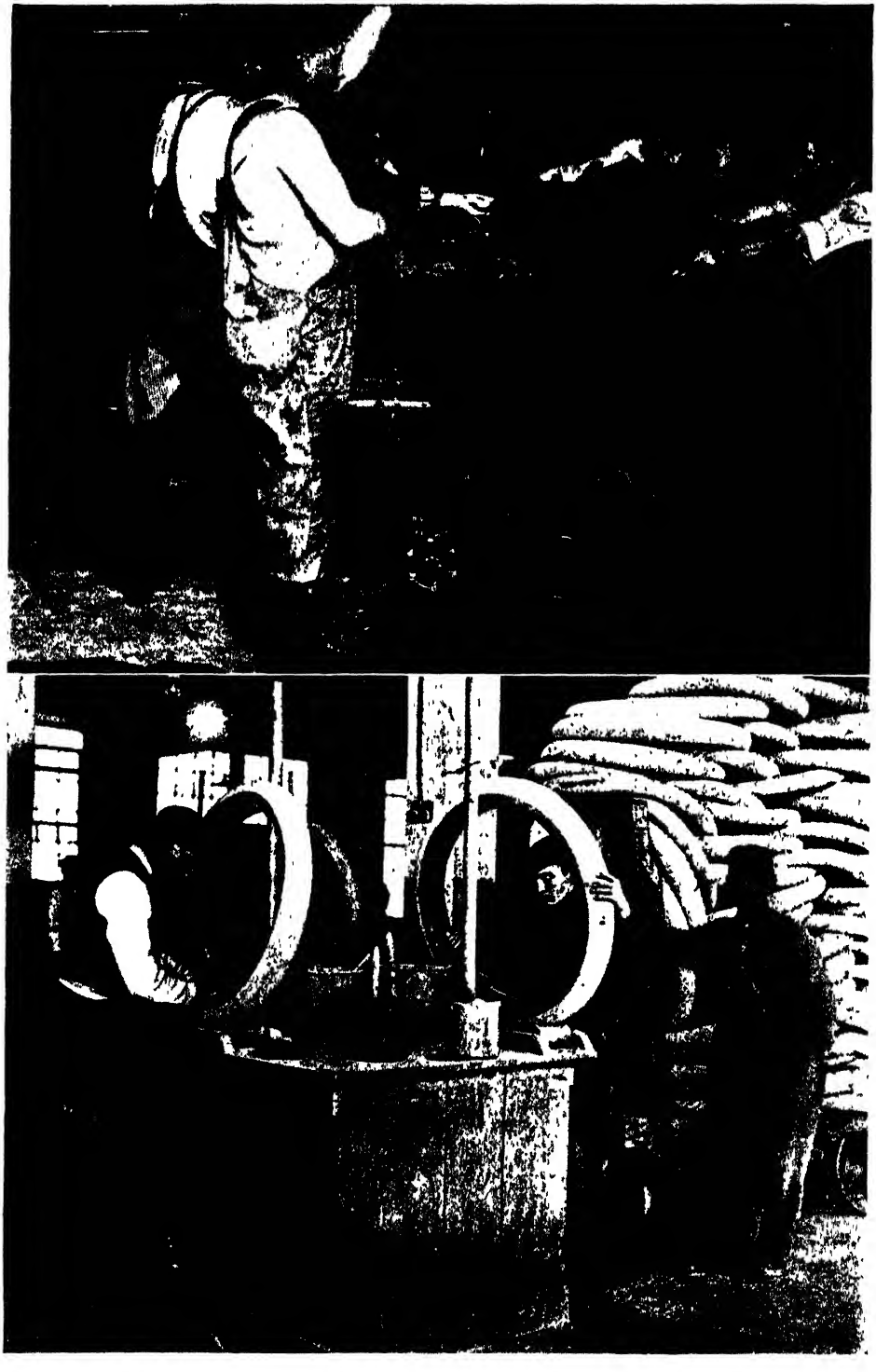
Making an Automobile Tire. (1). Unpacking one variety of crude rubber. Running crude rubber through a calender; this presses it into sheets.



Making an Automobile Tire. (2). Hanging sheets of rubber on drying lines. By a calendering process, shown in the second illustration, rubber and fabric are brought together; the entire sheet is strongly impregnated with rubber.



Making an Automobile Tire. (3). The tire-building operation, above. Another step in building the tire is shown below.



Making an Automobile Tire. (4). The machine which vulcanizes the tire. Below, workmen are engaged in final inspection, after which the tires are wrapped for shipment.

The next great improvement was the balloon tire, which appeared in 1923. It had a much larger cross section and a smaller diameter than the tires which had preceded it, and made possible the use of air pressures ranging from twenty-five to thirty-five pounds. The greater flexibility of this tire so increased riding comfort that it was soon widely used, especially on passenger vehicles. Rapid improvement was made in its construction, so that by 1925 balloon tires were giving 16,000 to 18,000 miles, and by 1929 tires with a 30,000 mile guarantee were being made, and special tires which with ordinary use would last as long as the car remained serviceable.

From the standpoint of structure, the pneumatic tire consists of the bead, which is a wire cable inserted in the portion next to the rim to prevent the tire from blowing out; the carcass, composed of several plies of cord fabric, protected from each other by thin coats of rubber; a cushion and breaker strip between the carcass and the tread, and the tread itself, the thick, firm face of the tire that comes in contact with the road. In building a tire, the plies of fabric are formed on a mold which is the size and shape of the inside of the tire. The fabric is rolled smooth, the bead is put on, the sidewall, breaker strip, and tread are added, and the tire is then vulcanized, or cured by heat and pressure, so that all of its parts are united. In the last named process, the mold is replaced by an air bag of identical size and shape.

Research is being continually carried on to give better mileage and more comfortable riding, and efforts are being especially directed toward the prevention of oxidation in rubber. To the rubber material are added anti-oxidants, or chemical compounds which tend to retard oxidation and thereby lengthen the useful life of the rubber. It is oxidation which causes rubber to deteriorate while standing idle, and to decompose with exposure to the air, and if the present experiments are successful, the most troublesome fault of rubber will be corrected.

By 1925 balloon tires had been perfected to the extent that the mileage averaged between 16,000 and 18,000 miles in comparison with the 7,000 to 8,000 miles furnished by the cord tires of 1920. Tire expense is the greatest upkeep item, and greater mileage, of course, will reduce this expense.

Akron, O., is the greatest center in the world for the manufacture of pneumatic tires. In an average year, the United States has produced more than 63,000,000 casings and 76,618,000 inner tubes. See AUTOMOBILE; MOTORCYCLE; BICYCLE.

PNEUMATIC TOOLS, implements used in industry which are operated by compressed air (which see). Pneumatic tools are of two classes —those which operate by striking and those which rotate. In the striking class are included hammers, riveting, calking, chipping, and rock-drilling tools. Drills and boring tools belong to the rotating class (see BORING MACHINES).

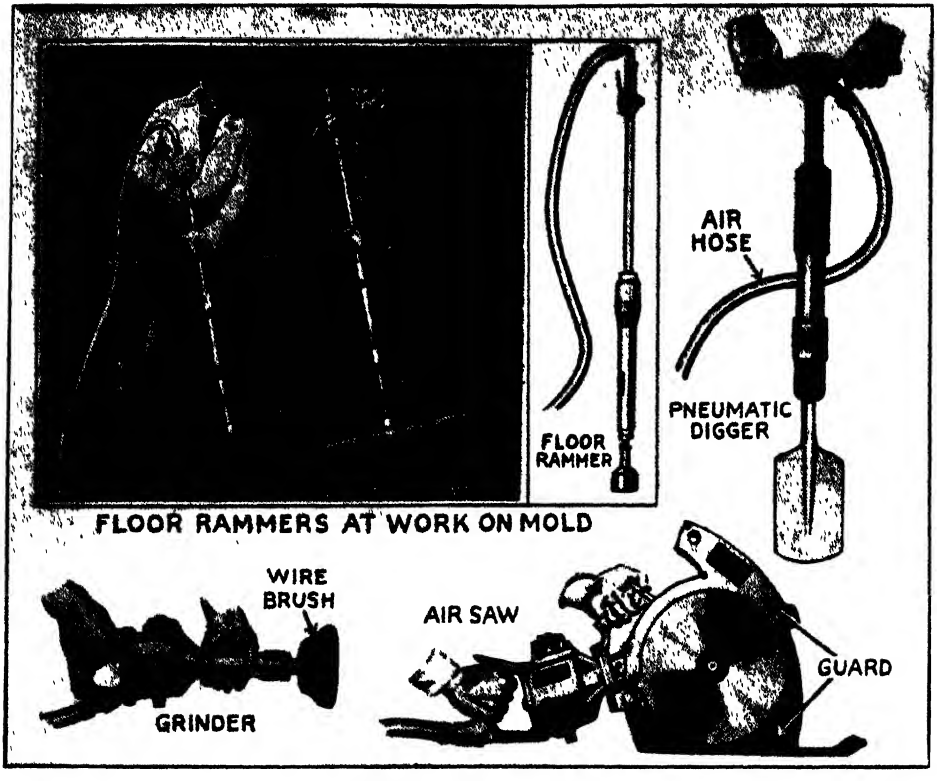
Probably the most efficient of all pneumatic tools is the hammer, with a piston in the handle working with a backward and forward motion. The power is supplied by compressed air through a flexible hose which allows the tool to be worked at any required angle. With such a hammer it is possible to deliver up to 20,000 blows per minute, city dwellers are familiar with its noisy operation in the processes of riveting the steel work in modern office buildings. The compressed air usually has a pressure of from eighty to 125 pounds per square inch, and is controlled by a valve in the handle of the tool. See illustration, page 5676.

PNEUMATIC TUBES, OR PNEUMATIC DISPATCH, a system or method of sending mail, dispatches, and parcels through tubes, either underground or above, by means of air pressure. In 1667 this method was suggested in a meeting of the Royal Society of London; a device was described by which a cylindrical metal carrier could be sent through tubes by means of suction. Improvements on this suggestion, which were not commercially adopted until 1853, have led to the development of various forms of pneumatic transportation devices in every civilized country.

The necessary apparatus consists of a series of tubes, an air compressor, and air-tight cylindrical carrying cases. The first pneumatic-dispatch tubes installed allowed the carriers to be sent only in one direction, and to but one destination. This was improved upon by the use of alternate suction and pressure, which allowed the carriers to travel both ways. This form was further modified by circular systems in which a current of air kept continually moving, and the carriers could be withdrawn from the tubes at regular intervals or stations.

The postal authorities and the telegraph companies in the United States have installed pneumatic-dispatch systems in most of the large cities. Department stores and large retail stores employ the principle in tubes for conveying money from the counters to the cashier's desk. These devices are controlled by patents, and all users lease the equipment.

In pneumatic tubes of two and a quarter inches in diameter, worked with an air pressure of ten pounds per square inch, containing carriers which hold seventy-five ordinary telegraph forms, a speed is obtained in transit of a mile in two and one-half minutes. Large tubes for pneumatic dispatch, eight inches in diameter, are built for conveyance of carriers seven inches in diameter and twenty-four inches long. These tubes require an air pressure equal to thirty horse power, and the carriers are propelled



TYPES OF PNEUMATIC TOOLS

through the tubes at the rate of thirty miles an hour.

PNEUMOCOCCI, *nu mo kok' si.* See BACTERIA AND BACTERIOLOGY (Kinds).

PNEUMONIA, *nu mo' nih ah,* an infectious disease of the lungs, with a high death rate. There are several types of pneumonia, varying according to the location and extent of the lung tissue involved. Persons over sixty-five and under five years of age are most susceptible to it; in children the smaller bronchi and their branches are usually affected, causing the type known as *broncho-pneumonia.* Several different germs cause pneumonia, but the *pneumococcus* group is responsible for most cases of lobar pneumonia, a common form in which the air sacs of an entire lobe or several lobes are filled with coagulated blood (see LUNGS).

Symptoms and Treatment. The onset of pneumonia is sometimes sudden, though an attack may be preceded by a hard cold, or may result as a complication of influenza, measles, and some other diseases. The initial symptoms are chills, pains in the chest, hard, dry cough, and high fever. In children convulsions often take the place of chills. The patient soon begins to raise a brownish-red phlegm from the lungs, and breathing becomes increasingly difficult. Fever and inflammation may run on from five to eleven days, and when the patient seems at his worst, the crisis occurs. In favorable cases, the fever abates and the breathing becomes easier, and the patient awakens feeling very weak but fairly comfortable. Physicians center their efforts on keeping up the patient's strength, supporting the heart, and reducing the temperature. It is essential that pneumonia patients have an abundance of fresh air, and in some hospitals they are treated on enclosed porches or in tents out of doors. In some mild cases, injections of muriate of quinine have arrested the disease within three or four days. Serums are of some value, but not all types of pneumonia respond. It is especially important to keep a patient in bed from the first day of illness until recovery is complete. Every case should be in the hands of a physician thoroughly competent to diagnose the case, and capable of prescribing the best treatment.

Transmission and Prevention. Pneumonia is transmitted from man to man; the organisms leave the body in the nose and mouth discharges, and infect other persons by way of the nose and mouth. The transmission may be direct or by contact with articles soiled

by the discharges. The danger of contagion is emphasized much more than formerly, and physicians and health officers are urging the advisability of isolating all pneumonia cases. Disinfection of discharges and of articles used by the patient is very important. During epidemics it is wise to keep one's bodily resistance high by rest, care in eating, and by avoiding excesses, alcohol, bad ventilation, and other unhygienic conditions. Crowds should be shunned. Pneumonia takes a high toll from persons of low vitality and from immoderate drinkers. It is also prone to attack those who have had pneumonia before. This is a disease that does not give immunity after one attack Not much progress has been made in preventive vaccination because of the numerous types of organisms causing the disease

Pneumonia prevails at all seasons of the year, but it is especially in evidence in the winter and spring. It can be guarded against by avoiding exposure to great cold and to storms of snow and rain Overheated rooms and places congested with people should be shunned. Poor ventilation is one cause of pneumonia. Since coryza (cold with running nose) and measles are followed by pneumonia, every person suffering from either of these infections should stay quietly in bed in a well-ventilated room and should eat sparingly. When a person has pneumonia, he should protect others by destroying all sputum both during the attack and for several weeks thereafter Spitting is a fruitful method of spreading the cocci of this disease. W.A.E.



Photo Visual Education Service

POCAHONTAS
After her marriage to John Rolfe

PNOM-PENH, *p'nom' pen' y'*, capital of Cambodia. See FRENCH INDO-CHINA.

PO, a river of Italy, the largest waterway in the kingdom. It is notable for its width, for the volume of water it carries from the mountains to the sea, and for the great fertility it gives to the lowlands along its course. From its source in Monte Viso, in the Cotian Alps, it flows in an easterly direction about 420 miles, receiving the Ticino, the Adda, the Mincio, the Penaro, and numerous other streams, and discharging through a large delta into the Adriatic Sea. It is rapid in its upper courses, but becomes a sluggish stream long before it reaches the sea. The Po carries considerable local commerce, and is well supplied with shad, salmon, and sturgeon.

In spite of artificial embankments, the first of which were built by the Etruscans about 300 B.C., disastrous floods repeatedly occur. The river's continual deposits raise the level of the water, and with the corresponding elevation in the embankments, the river at Ferrara has been raised to the level of the housetops. The deposits from the mountains are gradually increasing the extension of the delta into the sea Turin is the largest city on the Po Others include Cremona, Piacenza, and Casale Monferrato.

POACHING. See TRESPASS; GAME.

POCAHONTAS, *po-kah hahn' tas* (about 1595–about 1617), an American Indian princess, born in Virginia. She was the daughter of Powhatan, chief of a confederacy of Algonquian tribes named for him Powhatan's dealings with the white settlers made Pocahontas acquainted with several citizens of Jamestown, notably Captain John Smith. He mentioned her in his *True Relation of Virginia*, published in 1608, as a spirited and beautiful child of about ten years of age. He declared that his first meeting with her was in 1607, when her father was about to kill him with a great stone club. "At the minute of my execution," says Smith, "she hazarded the beating out of her owne braines" by placing her head upon his and begging her father to spare him. Much doubt has been thrown upon the story by historians, but whether true or false, it remains the first American romance. Pocahontas frequently visited Jamestown until Smith returned to England in 1609, and then she was not seen in the village for three years. During this time she became the bride of one of her father's Indian aides.

In April, 1612, Pocahontas was captured and held as a hostage for white prisoners in the possession of the Indians, and one year later she was converted to the Christian religion and baptized at Jamestown. In April, 1614, she married John Rolfe, and in 1616, after the birth of a son who was named Thomas, she went with Rolfe to London. There she

was introduced as the daughter of an American king, and was welcomed into the homes of royalty. In about a year, she and her husband started back to Virginia, but Pocahontas died, presumably of smallpox, at Gravesend, near London, where the record of her death and her tomb may still be seen in the parish church. Her son removed to Virginia in his early manhood, and from him sprang some of the most noted families of Virginia, among the most famous of such descendants being John Randolph, of Roanoke. Another descendant was Mrs. Edith Bolling Galt, who married President Wilson in 1915.

Related Subjects. The reader is referred in these volumes to the following articles

Powhatan	Rolfe, John
Randolph, John	Smith, John

POCATELLO, IDA. See IDAHO (back of map).

POCKET VETO. See VETO.

POCO A POCO, *po' ko ah po' ko,* a musical term. See MUSIC (A Course of Lessons).

POCONO, *po' ko no,* **PLATEAU.** See PENNSYLVANIA (The Land).

POE, *po,* EDGAR ALLAN (1809-1849), an American poet and story-writer, whose work, though limited in quantity and scope, bears the mark of an original and romantic imagination. Poe was born in Boston on January 19, 1809. His grandfather was a Revolutionary officer of an honored Baltimore family. Edgar's father was educated for the law, but married an actress, and himself went on the stage. Left an orphan at two years of age, Poe was adopted by Mr. Allan, a wealthy merchant of Richmond, Va. His education consisted of five years in an English school, several years in a Richmond academy, and one session at the University of Virginia, from which Mr. Allan removed him, probably because of extravagant losses at gambling.



WHERE "THE RAVEN" WAS WRITTEN

This "Poe Cottage," in Fordham, now a part of New York City, has been moved from its original location, shown above, to Poe Park, where it is preserved as a Poe memorial

The young man then tried employment in a counting room, but soon quarreled with his foster father and left home. In 1827 he reappeared in Boston, published his first volume of poems, and, in desperate need of money, enlisted in the regular army. After serving two years at Fort Moultrie and Fortress Monroe, he was honorably discharged through the intervention of Mr. Allan, who also obtained his entrance to West Point. Poe's deliberate unruliness there, followed by court-martial and dismissal within six months, turned his adopted parent irrevocably against him. In his school life, Poe left a record of wide reading and of ability in languages, mathematics, and athletics, but not of steady effort or good-fellowship.

The young writer was now on his own resources. In 1833, while living with his aunt, he won a one-hundred-dollar prize for the tale *A Manuscript Found in a Bottle.* This success brought him friends, and soon after his marriage with his beautiful young cousin, Virginia Clemm, he became connected with a Richmond periodical Within a year, by his tales, poems, and literary reviews, Poe increased the circulation of the magazine sevenfold. He worked tirelessly, and made this the most pleasant and fruitful period of his life Soon, however, he was set adrift to serve briefly but brilliantly with *The Gentleman's Magazine, Graham's Magazine,* and several others, but always with the same result—dismissal for unjust criticisms in his articles or for irregularity due to intemperance. The brightest part of his life story is his love for his child wife, but the strain caused by her long illness and her death in 1847 prostrated Poe, who never recovered his former vigor. Although never dissipated for long periods, he drank more and more frequently. Alcohol was always a maddening poison to his system, and at length he was found unconscious in Baltimore, where, on October 7, 1849, he died from his excesses. His burial place in that city is one of America's literary shrines (see BALTIMORE).

Poe's great intellect was not balanced by a strong character, and every step in his life shows the tragedy of a weak will. His work was of three kinds—critical, poetical, and narrative. His was the first broad and really artistic criticism in America, but although sometimes farseeing and stimulating, it was fully as often woefully wrong. His remarks on Longfellow were particularly violent, but the older poet met them with uniform charity, and was always unsparing in his praise of Poe's work. Poe defined poetry not as truth or as passion, but as music, and in this melody of words some of his own poems are unrivaled. *The Raven, The Bells, Annabel Lee,* and *Ula-*

lume show his power at its height. By reason, therefore, of this handful of short poems, he ranks among the truest poets America has ever produced. Original copies have been sold for high prices (see BIBLIOMANIA).



Photo: Brown Bros

EDGAR ALLAN POE

His life was crowded with changing scenes, and was overshadowed by constant reverses and ill fortune, brought about by his own faults of character. His literary career was distinguished, and reflected almost unapproachable genius.

Though Poe's greatest fame rests on his poems, he is best known in Europe for his tales, *Ligeia*, *William Wilson*, *The Gold Bug*, *The Purloined Letter*, *The Fall of the House of Usher*, and others, which lose little in translation. His realms of fancy are completely removed from actuality, and consequently are as real in one land or century as in another. Horror, ingenuity, and action he handled with consummate skill, but he had no power of character drawing. In his rather limited sphere, his unique genius has given him lasting and universal distinction.

POET LAUREATE, *law' re ate,* a title conferred by the Crown upon certain English poets. Among the ancient Greeks it was customary to crown with a wreath a poet who was successful in a contest, and from the laurel of which the wreath was composed has come the word *laureate.* Originally, the poet laureate had as a specific duty the writing of odes on important national occasions, but in late years this task has by no means been rigidly required. Tennyson, however, wrote a number of his best-known poems for state occasions. The laureate is by tradition a member of the royal household; the sum received by him has varied at different times, some of the earlier appointees having received as much as £300 ($1,500) a year, while the compensation to Tennyson was but £100 ($500). Ben Jonson was the first poet formally appointed laureate by the Crown, but certain poets before his time really performed the duties and were shown the honors which later belonged to the office. The complete list, including names of three "honorary" laureates, follows:

NAME	BORN	APPOINTED	DIED
Geoffrey Chaucer	1340?	1368	1400
John Gower	1325?	1400	1408
Henry Scogan, P L to Henry IV	1361?	?	1407
John Kay, P L to Edward IV	...	.	.. .
Andrew Bernard, P L. to Henry VII and Henry VIII	.	1486	1523
Robert Whittington	?	1512	?
John Skelton	1460?	1513	1529
Richard Edwards	1523?	1561	1566
Edmund Spenser	1552	1590	1599
Samuel Daniel	1562	1598	1619
Ben Jonson	1573	1619	1637
Sir William Davenant	1606	1638	1668
John Dryden	1631	1670	1700
Thomas Shadwell	1642	1688	1692
Nahum Tate	1652	1692	1715
Nicholas Rowe	1674	1715	1718
Rev. Laurence Eusden	1688	1718	1730
Colley Cibber	1671	1730	1757
William Whitehead	1715	1758	1785
Thomas Warton	1728	1785	1790
Henry James Pye	1745	1790	1813
Robert Southey	1774	1813	1843
William Wordsworth	1770	1843	1850
Alfred, Lord Tennyson	1809	1850	1892
Alfred Austin	1835	1896	1913
Robert Bridges	1844	1913	....

POETRY, one of the two great classes into which all literature is divided, the other being prose. A definition of poetry which is universally acceptable has perhaps never been written, and much controversy has raged over the subject. Some critics hold that if the thought contained is imaginative and makes an appeal to the emotions, and if the language is artistic and musical, the form is of little importance; while others declare the metrical form to be one of the first requisites. In general, however, the term *poetry* is seldom applied to any composition which is not metrical. That does not mean that all poetry must have the rhythmic swing to which modern ears are so well accustomed, for the Hebrew *Psalms* are

certainly poetry; and they had in the original a rhythm very perceptible to the people for whom they were written.

Though prose is the simpler form of composition, and it might be thought that prose literature would be the first to grow up, the opposite was the case. Almost every nation, in its very early stages, had poetry of some sort—songs which might be chanted to rude music, and which were almost invariably part of the worship of some god. And gradually the figurative language, the rhythmic form without the music, came to be used for other than religious purposes. The deeds of the gods, as well as their praises, are set forth, and then, by a natural transition, the deeds of great national heroes. Thus narrative poetry—the epic and the ballad—was one of the earliest forms of poetry. The lyric, too, was a direct outgrowth of these early songs set to music, and even dramatic poetry grew out of the choral chants in honor of Bacchus. These three classes really comprise all poetry, if satirical and didactic verse be excepted; and as these two contain little imagination or emotion, and appeal chiefly to the intellect, they are not by all critics classed with poetry.

As to the form of poetry, the variations which have been invented are almost infinite. Yet there are certain well-defined rules which no poet would violate. A tragedy in rhymed couplets, for instance, would be an impossibility, nor could an epic be composed in the meter of Shelley's *Ode to a Skylark*. Rhyme, meter, alliteration—all have a place in the making of poetry; and though occasionally a poet arises who, like Whitman, feels that he can dispense with verse form, the majority of readers, as well as many critics, will always feel a serious lack in his work. In this connection, see AMERICAN LITERATURE (The More Recent Poets).

Related Subjects. The following articles in these volumes supplement the foregoing discussion of poetry

Acrostic
Aeneid
Alliteration
Ancient Mariner, The
Ballad
Bard
Beowulf
Biglow Papers
Canterbury Tales
Charge of the Light Brigade
Courtship of Miles Standish
Didactic Poetry
Elegy
Epic
Evangeline
Hiawatha
Idyll
Idylls of the King
Iliad
Lake School
Lyric Poetry
Meter
Mother Goose
Nibelungenlied
Ode
Odyssey
Paradise Lost
Pastoral Poetry
Poet Laureate
Rhyme
Rubaiyat
Sonnet
Spenserian Stanza
Troubadour

POETS

Addison, Joseph
Anacreon
Annunzio, Gabrielle d'
Arnold, Sir Edwin
Arnold, Matthew
Austin, Alfred
Blake, William
Bradstreet, Anne
Bridges, Robert
Browning, Elizabeth Barrett
Browning, Robert
Bryant, William Cullen
Bulwer-Lytton, Edward Robert
Burns, Robert
Butler, Samuel
Byron, George Noel Gordon
Campbell, Thomas
Carleton, Will
Carman, Bliss
Cary, Alice and Phoebe
Catullus, Caius Valerius
Chapman, George
Chaucer, Geoffrey
Coleridge, Samuel Taylor
Cowper, William
Dante Alighieri
Drummond, William Henry
Dryden, John
Dunbar, Paul Laurence
Emerson, Ralph Waldo
Field, Eugene
Fitzgerald, Edward
Gay, John
Goethe, Johann Wolfgang von
Goldsmith, Oliver
Gray, Thomas
Guest, Edgar A.
Halleck, Fitz-Greene
Hayne, Paul Hamilton
Heine, Heinrich
Hemans, Felicia Dorothea
Herrick, Robert
Holmes, Oliver Wendell
Homer
Hood, Thomas
Horace
Howe, Julia Ward
Hugo, Victor Marie
Hunt, [James Henry] Leigh
Ingelow, Jean
Juvenal (Decimus Junius Juvenalis)
Keats, John
Key, Francis Scott
Kilmer, Joyce
Kipling, Rudyard
Lamartine, Alphonse de
Langland, William
Lanier, Sidney
Larcom, Lucy
Le Gallienne, Richard
Longfellow, Henry Wadsworth
Loveman, Robert
Lowell, James Russell
Lucretius, Titus Caius
Markham, Edwin
Martial (Marcus Valerius Martialis)
Masefield, John
Masters, Edgar Lee
McCrae, John
Meredith, George
Millay, Edna St. V.
Miller, Cincinnatus Heine
Milton, John
Moody, William V.
Moore, Thomas
Morris, William
Musset, Alfred de
Noyes, Alfred
Omar Khayyam
Ovid
Payne, John Howard
Perry, Bliss
Pindar
Poe, Edgar Allan
Pope, Alexander
Procter, Adelaide Anne
Read, Thomas Buchanan
Reese, Lizette Woodworth
Riley, James Whitcomb
Rossetti (family)
Sachs, Hans
Sappho
Saxe, John Godfrey
Scott, Sir Walter
Seeger, Alan
Service, Robert
Shakespeare, William
Shelley, Percy Bysshe
Sidney, Sir Philip
Simms, William Gilmore
Simonides
Smith, Samuel Francis
Snorri, Sturluson
Southey, Robert
Spenser, Edmund
Stanton, Frank L
Stedman, Edmund Clarence
Stevenson, Robert Louis Balfour
Suckling, Sir John
Swinburne, Algernon Charles
Tagore, Sir Rabindranath
Tasso, Torquato
Tegner, Esaias
Tennyson, Alfred
Theocritus
Thomson, James
Timrod, Henry
Van Dyke, Henry
Vergil
Voss, Johann Heinrich
Watts, Isaac
Whitman, Walt
Whittier, John Greenleaf
Wieland, Christoph Martin
Wilcox, Ella Wheeler
Willis, Nathaniel Parker
Wordsworth, William
Yeats, William Butler
Young, Edward

POETS' CORNER. See WESTMINSTER ABBEY.

POGONIA, a genus of North American orchids (see ORCHID).

POGY, *po' gih,* a local name for the menhaden (which see).

POI, a national dish of the Hawaiians. See HAWAII (The People); COLOCASIA.

POINCARÉ, *pwaN kah ra',* RAYMOND (1860-), President of France from 1913 to 1920, a leader of the republic during the World War, and four times Premier of France. Throughout his long public career he has been known as a man of high ability, tireless energy, and intense patriotism.

Born in Bar-le-Duc, Lorraine, he was educated for the law and became a highly successful practitioner in Paris. He gained a comfortable fortune and founded his subsequent career on the firm basis of financial independence. His first public office was that of a member of the Chamber of Deputies, to which he was elected at the age of twenty-seven. In 1893 he became Minister of Education, and, although the youngest Minister of the republic, he performed his duties with fidelity and distinction. The following year he was made Finance Minister, and in this post he gained a reputation which finally elevated him to the Presidency. Meanwhile, he became Premier in 1912, and devoted his efforts to strengthening the Triple Entente, the friendly alliance of France, Russia, and England.

Poincaré's election to the Presidency, in 1913, occasioned the utmost enthusiasm in the republic. It was felt that the affairs of the nation were in strong hands, and that its interests would be fully protected. On the outbreak of the World War, it was seen that this confidence was not misplaced. Poincaré did not hesitate. He appealed to the Chamber for war supplies, which were voted unanimously. He stimulated his Ministers to great activity in all war measures. He raised the country to a high pitch of patriotism. Even Clemençeau, who was opposed to him politically, said that at no time did Poincaré show the least sign of weakness.

When things went badly for France and the Allies, when Paris was in danger of capture, Poincaré showed a calm resolution, a capacity for endurance, and a relentlessness of purpose that could not be shaken. His firmness and courage were indisputable factors in the final victory.

After completing his term as President, he was elected to the Senate in 1920. At this time he began discussing public affairs in articles written for the leading newspapers and magazines. On account of his prestige, the influence of his writings was tremendous. It has been said that he became the most powerful journalist that France ever had. The great question before the French people at this time was the collection of war reparations from Germany. Although the Treaty of Versailles provided for indemnities, they were not paid as provided, because of Germany's apparent inability to make the large payments required. What was to be done? Poincaré believed that the full and prompt payment of the indemnity was necessary for the self-preservation of France, and he advocated the enforcement of the French claims, even though it meant the occupation of German territory.



Photo: Brown Bros

RAYMOND POINCARÉ

Because of his definite position on this question, which accorded with the views of the French people, Poincaré was made Premier in 1921 and proceeded to carry out his reparations policy. He remained in power until 1924, and gave his chief attention to foreign affairs. Meanwhile domestic questions, chiefly financial, became critical, and in the May elections his régime was defeated.

Within two years, however, he was back in power. The desperate struggle to balance the budget and stabilize the franc had brought more than one political crisis, and proved the downfall of several Ministers. Poincaré was recalled to the Premiership, and he proceeded to form a strong coalition Cabinet. He took over the Ministry of Finance and introduced at once a bold policy of retrenchment and economy. Under his able management, the franc made a notable recovery and the budget was balanced for the first time since the war.

In November, 1928, the Poincaré Cabinet fell, when four of its members, who belonged to the Radical Socialist party, resigned because of lack of sympathy with current measures. Poincaré, along with his aides, resigned. After more than a week of surveying the field for other potential leaders of the government, President Doumergue again placed the authority with Poincaré. The Premier gave up the Ministry of Finance and took over the position, without portfolio, of the "Ministry of Debts and Reparations." Thus, for the fourth time, Poincaré became Premier of France. He served in this office until the ratification of the American debt-funding plan by the Chamber of Deputies and French Senate, in July, 1929, when he resigned on account of ill health.

Notwithstanding the many years he has spent in public service, Poincaré is not the usual type of public man. He is averse to publicity and display of every kind. He is modest, silent, and prefers to work in solitude.

His capacity for work has been commented upon by all who have come in contact with him. His greatest quality is his single-minded devotion to the interests of his country. Although his social tastes are simple and he prefers a plain and quiet life, yet he is not without sympathetic qualities. During the years of his Presidency, he sent all the gifts that were tendered him to the charity societies, in order to have them utilized by those who were in need. See FRANCE (History).

He has been honored by election to the French Academy, and in 1914 he was made lord rector of Glasgow University.

His Writings. In addition to many articles in magazines and newspapers, Poincaré has published the following books: *Idées Contemporaines*; *Études et Figures Politiques*; *How France is Governed*; *Histoire Politique*; *Chroniques de la Quinzaine*; and *Les Origines de la Guerre.*

POINSETTIA, *poin set' ih ah,* a tropical plant of the spurge family, named after Dr. Poinsett of Charleston, S. C., who introduced it to American horticulture about 1835. It is the gorgeous red foliage of the poinsettia that makes it so popular for decorations during the Christmas season. In the Southern United States, the plant blooms in gardens from July to September, and grows to a height of two or three feet; the tall, woody stem bears lance-shaped leaves, the lower ones green, and those near the top bright red. These latter are bracts (see BRACT), for the real flower is the yellow center of the brilliant scarlet foliage cluster. In the Northern states, the plants are often cultivated in hothouses. In recent years pale or white-bracted varieties have been developed. See SPURGE FAMILY. B.M.D.

Scientific Name. The poinsettia belongs to the family *Euphorbiaceae.* Its botanical name is *Euphorbia pulcherrima.*

POINT. See TYPE.

POINT BARROW. See ALASKA.

POINTER, a dog trained to stop at the sight of game and point toward it with the nose. It is used in hunting birds. With setters and retrievers, pointers are classed as field dogs. They have a remarkably keen sense of smell, and can track their prey rapidly and accurately. These dogs are sure-footed, strong, alert, and smooth-coated. They weigh about fifty pounds. Liver and white is the typical color, though some European breeds are black and white or all black. See DOG; RETRIEVER; SETTER. M.J.H.

POINT LOMA. See SAN DIEGO, CALIF.

POISON, *poi' z'n,* a substance that, when taken into the body, causes illness or death. So general a definition, however, needs some modification. There are some substances that are not usually harmful in small doses, but which it would be fatal to take in large quantities. This is true of many medicines. The age, condition of health, and habits of individuals are all important factors in determining the effects of a poison, and so the term is a relative one. Poisons are sometimes classed as *irritants* and *nerve poisons.* Among the former, which burn or produce inflammation, bringing about local chemical changes, are strong mineral acids, caustic alkalies, and various compounds of phosphorus and mercury; among the latter, which act on the nervous system and cause such symptoms as convulsions, delirium, and stupor, are alcohol, belladonna, chloroform, and strychnine. Still another class is the group of poisonous gases, which render the victim unconscious through lack of oxygen, or affect heart action. Modern science also classes disease germs as poisons, or as poison-producers. T.B.J.

Poisoning as a Crime. The criminal use of poisons has a large place in fiction, history, and the annals of court procedure It is an interesting fact that some poisons remain in the body for years after death, and can be traced by chemical analysis when the murderer has long fancied himself free from suspicion Among the famous poisoners of history were Agrippina, mother of Nero, Catharine de' Medici; Cesare Borgia, and his sister Lucrezia (see articles on these persons) In the Middle Ages, in Europe, poisoning was considered an art, and there were numerous dispensers of deadly drugs who made murder a profession

Related Subjects. Directions for overcoming the effects of poison taken by way of the mouth are given in full in these volumes under the heading ANTIDOTE For treatment in case of dog bite, see HYDROPHOBIA, for snake bite, see SNAKE See, also, ASPHYXIATION, POISON GAS; DISEASE, PTOMAINES



Photo U & U

CHARACTERISTIC POSE OF THE POINTER

POISON, ANTIDOTES FOR. See ANTIDOTE.

POISON BAIT. See INSECTICIDES AND FUNGICIDES.

POISON CLAWS. See CENTIPEDE.

POISON ELDER. See ELDER, for classification.

POISON GAS. When the Germans in April, 1915, sent clouds of a strange gas against the allied forces at Ypres, which asphyxiated those who breathed it and caused terror and consternation, they were introducing into modern warfare a weapon that was utilized by all the belligerents before the close of the war. The chemists of the allied nations proved as resourceful as those of Germany, and when the war ended the Americans had ready for use a gas so deadly that small quantities of it would have wiped out whole armies and the populations of great cities. The terrible possibilities of chemical warfare were considered by the nations in the international conference on limitation of armaments held in Washington in 1921, and by 1929, nine nations—Germany, Poland, France, Belgium, Italy, Russia, Austria, Venezuela, and Egypt—had agreed to accept the protocol of the League of Nations against the use of poison gas in warfare. Also, in 1929, Great Britain announced its intention to accept the protocol.

The various compounds used have different effects. Some cause irritation of the throat and nose; some produce temporary blindness by causing excessive flow of tears. There are sneezing gases, asphyxiation gases, gases causing paralysis of the nerves, gases that burn, and gases that cause death by affecting heart action. Most of the poisonous compounds contain chlorine (which see).

As to methods of dissemination, the gases are liberated from containers and then carried by wind currents, or are enclosed in explosive shells and hurled against the enemy by ordinary bombardment. Various types of masks have been devised as a protection against gas attacks. These usually contain neutralizing chemicals, or an absorbent substance like charcoal, to nullify the effects of the gases. See WORLD WAR.

Tear gases are sometimes used by policemen in capturing criminals The use of highly poisonous gases as fumigants to kill vermin is a dangerous procedure and should not be attempted in the home without proper supervision. See FUMIGATION. T.B.J.

POISON IVY. See IVY.

POISONOUS, *poi' z'n us,* **PLANTS** are, generally speaking, those which are injurious in their effects, either when touched or when eaten. No sharp distinction can be drawn between poisonous and non-poisonous species, however, as many plants which are harmful to some persons can be eaten by others without ill effects; others are poisonous in the native condition, but are harmless when cooked. The poisonous principle is found in seeds, foliage, fruit, roots, or tubers. (See page 5684.)

Many standard medicines are prepared from plants generally regarded as poisonous. Poison ivy and poison sumac are among the most common of those plants poisonous when touched, though not all persons are affected by them. Belladonna, or deadly nightshade, is a flowering herb poisonous in all its parts, but highly valued for medicinal purposes. It belongs to the nightshades, or *Solanaceae,* a large family of plants containing many poisonous species. Stramonium, or Jimson weed, is a poisonous member of this family, and another representative is the tobacco plant. The family also contains such useful species as the potato and tomato, but the foliage and other green parts of the edible species often contain poisonous juices [see BOTANY (illustration)]. The mushroom group includes both edible and poisonous species. A plant very harmful to cattle is the loco weed. B.M.D.

Related Subjects. The reader is referred in these volumes to the following articles

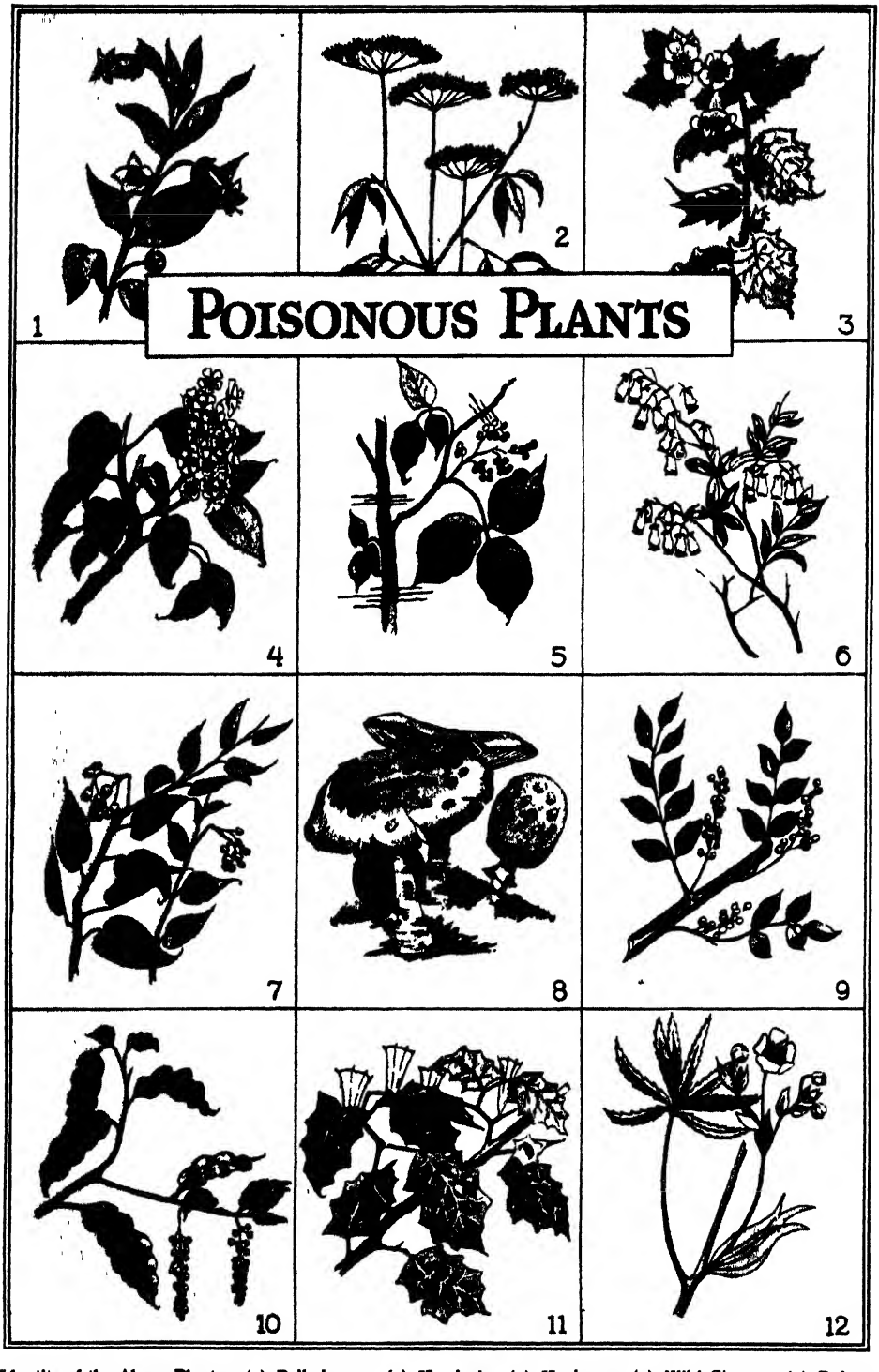
Aconite	Ivy
Antidote	Loco Weed
Belladonna	Mushrooms
Digitalis	Nightshade
Hellebore	Stramonium
Hemlock	Sumac

POISONS AND INFECTIONS IN THE BODY. See LIFE EXTENSION (Rule 12).

POITIERS, *pwah tya',* BATTLE OF, the second great victory of the English in the Hundred Years' War, fought in 1356 between Edward, famous as the "Black Prince" of England, and King John of France. Although the French army was double that of the English, the Black Prince won the battle by dispatching a small force of horsemen to the rear of the enemy. When, at the crisis of the battle, the English horsemen appeared, the French melted rapidly away, until only a small group, including John and his son Philip, remained. In the end they were killed or captured to a man. Another important battle was fought in this vicinity when the Saracens were defeated by Charles Martel in 732.

The town near which these two famous battles were fought is now the capital of the department of Vienne, fifty-eight miles southwest of Tours. Its narrow, crooked streets and picturesque houses, with their many historic or romantic associations, are typically medieval. Poitiers contains the oldest Christian church in France—Saint Jean's—and many other interesting churches and cathedrals. Population, about 42,000. See EDWARD, THE BLACK PRINCE; CHARLES MARTEL.

POKEWEED, a tall, branching herb bearing greenish-white flowers and deep-purple, juicy berries. A native of North America, it flourishes in waste places and along roadsides from Ontario to Florida and west to Texas and Minnesota. The stem grows from four to ten feet high, and in the fall, when the leaves are red and the berries ripe, the plant has a brilliant appearance. The berries are used to color wines, and when dried, together with the



Identity of the Above Plants. (1) Belladonna. (2) Hemlock. (3) Henbane. (4) Wild Cherry (5) Poison Ivy. (6) Stagger Weed. (7) Climbing Nightshade. (8) Amanita Muscaria. (9) Poison Sumach. (10) Pokeberry. (11) Jimson Weed (12) Hellebore.

poisonous roots, they are put into medicines used in the treatment of skin and blood diseases, and to relieve pain and inflammation. In some localities the young shoots are boiled and served like asparagus. Pokeweed seeds are thought to be poisonous, and old leaves are considered unwholesome. One should be very careful about using this plant as food. B.M.D.

Botany. The pokeweed belongs to the family *Phytolaccaceae*. Its botanical name is *Phytolacca decandra* It is known locally by numerous common names, such as *poke*, *scoke*, *pigeon berry*, *red nightshade*, *ink plant*, and others

POLACCO, GIORGIO (1875-), a musical director and conductor of grand opera. He was born at Venice, Italy. When still a child, he was taken to Russia's capital, then known as Saint Petersburg, where he began his studies. When his family returned to Italy to take up residence in Milan, Polacco continued his musical work under noted teachers of that city, and at the age of twenty-two, he became conductor at the Lyric International Theater at Milan For three years he directed the orchestra at La Scala Theater of that city, and subsequently won recognition for his achievements in the world's foremost opera houses He introduced French works in Italy, Russian in South America, and many novelties in the Metropolitan organization, New York City, and in the Chicago Opera Company. His repertory includes over 150 operas of all schools Polacco became identified with the Metropolitan Opera Company in 1915. Since 1920 he has been musical director and chief conductor of the Chicago organization, now known as the Chicago Civic Opera Company. His wife, Edith Mason, a leading operatic soprano, divorced him in 1929, and she soon married again. See MASON, EDITH.



Photo Moffett

GIORGIO POLACCO

PO'LAND, since 1918 an independent republic of Central Europe, lying between Germany and Russia. On the south are Czechoslovakia and Rumania, and on the north Lithuania and East Prussia. Irregular in outline, the country thrusts out a narrow arm to the north between Germany proper and East Prussia to reach the Baltic Sea, its only outlet. Covering an area of about 150,000 square miles, Poland is now less than half its size at the time of its greatest territorial expansion.

The People and Cities

The People. Nearly thirty million people live in Poland, about eighteen million of whom are Poles, the remainder being largely Ukrainians, White Russians, Germans, and Jews. The majority of the Poles are Roman Catholic, while the Ukrainians are Greek Catholic; the Jewish population numbers about eight per cent of the whole, and centers chiefly in cities of commercial importance. In the second half of the nineteenth century, the density of the rural population was greater than the land could support, and great numbers emigrated, principally to America, where the Polish population is about 2,500,000, including those born in America of Polish parents as well as native Poles.

Education, while free and compulsory for pupils below the age of sixteen, is still inefficient, but is receiving greater attention than formerly. There are six universities, that of Cracow dating from as early as 1364, and there are several institutions for technical and scientific study, and 195 colleges for teachers.

The Cities. About twenty-five per cent of the population is urban, and the majority of the people are of the peasant class. The following are the principal cities:

Cracow, *kra' ko*, or **Kraków,** *krah' koof* (Polish), an ancient historic city, presenting an imposing appearance with its numerous churches, towers, and the old castle where lived the Polish kings Cracow for centuries was the capital of the kingdom of Poland, until superseded by Warsaw in 1610, in the famous Gothic Cathedral of Stanislaus, Polish kings were crowned and buried Here also are buried many of the national heroes, including John III (Sobieski), Kosciusko, Poniatowski, and Mickiewicz. Cracow, with its university founded in 1364, has long been the intellectual center of Poland. A mining academy and a fine-arts academy have also been established

Located on the Vistula River, the city carries on a large trade both by land and water, lumber, grain, cattle, and salt being exported in great quantities At Wieliczka, within eight miles of the city, are some of the largest salt mines in the world. Leather, machinery, and chemicals are manufactured, and there is a growing production of textile fabrics. Cracow is a heavily fortified city, and in 1815 was the capital of a short-lived republic of Cracow. Its population of nearly 184,000 makes Cracow the fifth city in size in Poland

Lemberg, *lem' behrK*, or **Lwów,** *lvoof* (Polish), is situated on the River Peltew, 365 miles northeast of Vienna. The place is defended by a citadel, around which the modern town has grown up; most of the prominent buildings are found in the suburban districts It is an ecclesiastical center, and there are imposing Greek and Roman Catholic cathedrals; the city also possesses the third oldest university in Poland In the Ossolinski National Institute are valuable collections of Polish historical and literary relics There are manufactures of many commodities, and the city enjoys a considerable trade in agricultural products.

Lemberg was founded in the thirteenth century, and has had a varied history, having suffered many



Photo P & A

AN AIRPLANE VIEW OF THE CITY OF WARSAW

times from siege and bombardment As the capital of the crownland of Galicia, belonging to Austria-Hungary, Lemberg, during the World War, was twice the center of a series of battles between the Russians and Austro-German forces After the war, in 1918, Galicia, which is Polish, was taken back by Poland. Population, about 219,500

Lodz, *lawdz* (*looj* in Polish), the capital of the district of Lodz, eighty-seven miles southwest of Warsaw, to which it ranks second in size It is a city of no architectural beauty, but is an important industrial center, and in the manufacture of cotton and woolen textiles, it holds foremost position in Poland Correlated with the city's industrial activities, a school of social and economic studies was opened in 1925

During the World War, Lodz was the scene of several severe battles, and suffered a destructive bombardment by the Germans, who captured and occupied the city, using it as a base for drives on Warsaw. Its population of about 452,000 is sixty per cent Polish and forty per cent Jewish.

Posen, *po' zen*, or **Poznan,** *pawz' nahn y'* (Polish), capital of the old province of Posen, is situated on the Warthe River, in the extreme western part of Poland, 150 miles east of Berlin Posen is surrounded by two lines of forts, and is built with considerable regularity, with numerous squares from which radiate many wide streets The buildings of greatest interest are the cathedral, dating from the eighteenth century; the town hall, containing valuable archives, the Raczynski Palace, with its library; and a provincial museum of antiquities The making of furniture and the manufacture of agricultural implements are important enterprises, and there are numerous distilleries and flour mills Population, about 185,000.

Vilna, *veel' nah*, or **Wilno,** *veel' no* (Polish), a city acquired by Poland since the World War (see subhead *History*), is located 436 miles southwest of Leningrad. It is the historic capital of Lithuania At one time the seat of Polish and Jewish culture, the city is still an educational center. The main institutions include three classical gymnasia, a Greek Orthodox and a Roman Catholic seminary, an excellent public library, and an archaeological museum Religious buildings are also numerous and interesting, and there are many ancient monasteries and churches in the suburbs The chief manufactures are knit goods, tobacco, buttons, gloves, artificial flowers, etc , and the principal trade is in timber and grain The population is about 129,000, consisting mainly of Jews, Lithuanians, and Poles

Warsaw, or **Warszawa,** *vahr shah' vah* (Polish), the capital, metropolis, and intellectual center of the republic, is beautifully situated on the south bank of the Vistula River, about 400 miles directly east of Berlin and 695 miles southwest of Leningrad. Because of its location between Russia and Germany, Warsaw was the scene of stubborn battles during the World War

Except the oldest section, where the crooked lanes and curious old buildings have a medieval appearance, Warsaw is a city of well-constructed streets and buildings Many fine squares, the magnificent Grand Theater, two spacious boulevards, attractive parks and gardens, and numerous imposing palaces and churches give the city an air of distinction Many of the palaces have been put to municipal uses The university was founded in 1816 Other educational institutions include a musical conservatory, an agricultural institute, an art school, and a technical college A radium institute and hospital has been erected as a monument to Madame Curie, a native of Warsaw Bridges over the Vistula which were destroyed by the Germans during the World War have been rebuilt.

Warsaw has long been a leading industrial and commercial center, having numerous book-printing plants, and flourishing factories producing machinery, food products, woven goods, boots and shoes, and many other commodities. There is a thriving trade in corn, coal, and leather. In 1926 a Soviet Chamber of Commerce was opened. The population numbers 1,000,000, of whom nearly thirty-five per cent are Jews.

Resources and Industries

Forestry and Agriculture. In general, Poland is an unbroken plain, almost a quarter of which is covered with forests, making the timber industry important. The state owns about thirty per cent of the forests, and the varieties include Scotch pine, spruce, fir, beech, oak, alder, birch, and elm. But the country is essentially agricultural, over half the population being peasant farmers. Since 1925 the size of holdings has been limited, the state taking over the large estates, many of which were lying idle, and redistributing the land among the small holders. In the industrial area an owner may retain 148 acres; in the border provinces, 1,000 acres; and elsewhere, 435 acres.

The potato yield is immense, amounting to nearly 30,000,000 tons annually, and forming the main diet of the peasant class, the surplus is used for the distillation of alcohol and the manufacture of starch. Sugar beets rank next in production, and seventy refineries produce over half a million tons of sugar in a year Grains also are grown, as well as hemp, hops, and flax Horse-breeding is a progressive industry, and cattle, pigs, and poultry provide valuable items of export.

Minerals. Poland obtained valuable mineral resources in connection with the new territory acquired after the World War. The Upper Silesia area has enough coal to last 300 years, with an annual production of 40,000,000 tons, and gives Poland rank next to Germany and Great Britain as a coal-producing country Zinc mines, too, were included in the newly added territory, and now about eighteen per cent of the world's zinc is mined in Poland The province of Galicia is rich in petroleum, the production now is equal to the output before the World War, and is rapidly increasing, the refining capacity is ample.

The government took over the control of the petrol production in an effort to supply the population with cheap oil However, financial and labor difficulties resulted, because the oil was not paid for by the government until long after it had been piped. It is necessary to sink many of the wells very low, and lack of capital has been a serious impediment to the industry. Natural gas, to the extent of about 500,000,000 cubic meters a year, is produced, and the greater part of current production is controlled by French capital. Poland has an almost inexhaustible supply of salt, and the mines are government-owned

Manufacture. In addition to iron and steel products, the manufactures include cotton and woolen textiles. Devastated during the World War and experiencing great loss of machinery and raw materials, Poland suffered a decline of manufacturing prosperity, and the textile industry was forced to seek foreign credit for rebuilding The production now exceeds the pre-war figure by forty per cent.

Communication and Commerce. The most urgent railroad problem was that of providing accommodation for the new alignments of trade. Formerly, the main routes led to Leningrad, Vienna, and German centers, but when Poland secured an outlet to the sea, railroad facilities toward Danzig became necessary, and communication with Upper Silesia was subsequently demanded. With the aid of an American advisory railway mission, the republic made good progress, and by 1923 the railroads were in an excellent condition. Poland's entire system of railways, aggregating over 16,500 miles, is state-controlled.

The Vistula River is an important highway of commerce, leading from the interior northward to the Free City of Danzig. Not satisfied to benefit from a seaport not wholly under its control, Poland began in 1928 to develop a new port on its own territory, a little east of Danzig.

The village of Gdynia, a fishing port, was chosen as the new Polish maritime center, and vast port developments were at once inaugurated. A project has been advanced to provide a trans-European trade route by widening and deepening the Vistula and Dnieper, building a canal between the two rivers, and canalizing the latter to the Black Sea. Poland's trade is carried on chiefly with its European neighbors and the United Kingdom.

Government and History

Government. The Constitution of Poland, adopted in 1921, is liberal. It provides for a two-chamber legislative body, composed of a Senate and a Sejm, or House, elected by universal suffrage on the basis of proportional representation. This body elects a President for seven years, who exercises the executive power and is assisted by a Cabinet of Ministers appointed by himself and responsible to the legislative body. The local divisions are granted a wide measure of autonomy.

Early History. During the early period of its existence, the country was divided into small communities under the reign of Mieczyslaw I (962-992). These communities were united into the semblance of a nation. Mieczyslaw was a vassal of the German emperor, and he renounced paganism for Christianity. During the reign of his successor and son, Boleslaw the Brave (992-1026), Poland became an independent kingdom, and its territory was enlarged. In succeeding reigns the country was involved in numerous wars with surrounding nations, but it continued to prosper until 1240,



Photo U & U

A PEASANT HOME IN POLAND

House and barns are connected, so that it is possible for the farmer to care for his livestock after dark without danger from bears or wolves

when it was invaded by the Mongols, who defeated the Poles, Silesians, and Teutonic Knights in the Battle of Liegnitz (April 9, 1241). Poland was then divided into a number of independent principalities, and the dissensions among these petty states caused the loss of much territory. During this period, Germans began to settle in the country and took a leading part in developing industries and municipal institutions. The country was restored under Ladislas I (1306-1333). He abolished many abuses and instituted the Diet, or legislative assembly. Under his successor, Casimir III, the Great (1333-1370), Poland increased rapidly in wealth and in power.

Casimir was succeeded by his nephew Louis the Great, king of Hungary, whose daughter Hedwig became queen in 1384 Hedwig married Jagello, prince of Lithuania, and thus established the Jagellon dynasty, which continued to 1572. During this period Poland attained its highest point in wealth and influence. In 1569 the union of Lithuania to Poland was proclaimed. The kingdom then extended from the Baltic Sea to the Dniester.

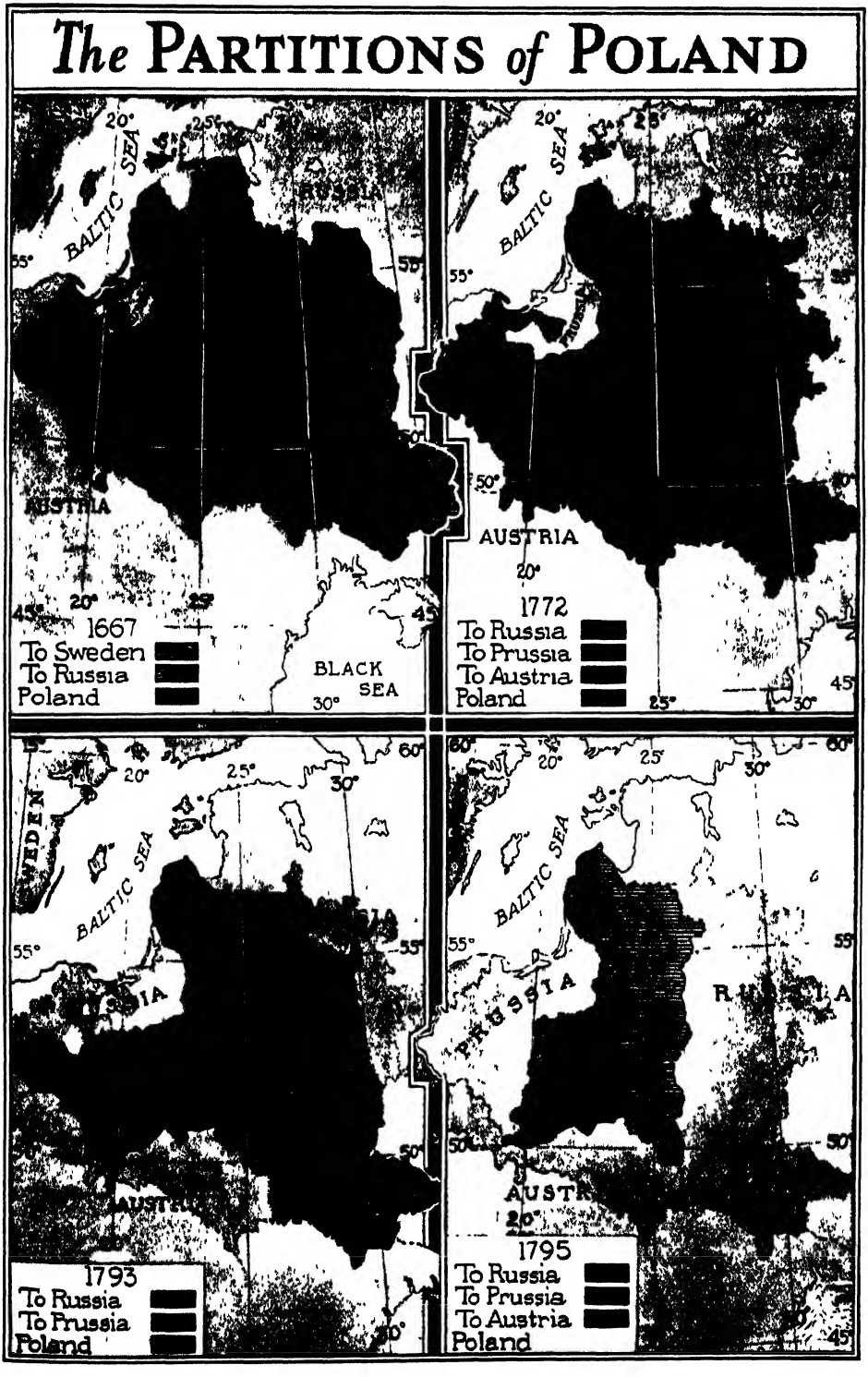
The last of the Jagellons died without an heir, and from that time the kings were elected by the Diet, which consisted of two houses—the Senate, composed of the chief nobles, and the Nuncios, or House of Representatives, composed of the inferior nobles. The decision was required to be unanimous, and the curious privilege was granted the nobles by which cooperating groups might enforce their will upon the others by resorting to arms.

Owing to the jealousy of the nobles, the king was usually chosen from the royal family of some other nation, and a foreign king was not always in full sympathy with the people over whom he was placed. A number of Polish kings, however, were elected, and among the most noted of these was General Sobieski, who became king in 1674 under the title of John III. By his ability as a soldier and statesman, Sobieski preserved Europe from Turk invasion, defeating the Turkish army under the walls of Vienna in 1683.

Partitioning of Poland. The seeds of dissension which led to Poland's downfall had been sown long before Sobieski's day. The condition of the country is thus described by Whitcomb in his *History of Modern Europe*:

> A weak state, lying between the rising powers of Russia and Prussia, Poland had little chance of preserving her nationality The arrogance of her nobles and the faults of her constitution prevented her accomplishing the transition from a medieval to a modern state Poland was a monarchy of twelve million people, ruled by three hundred thousand nobles, who lived from the labor of a degraded peasantry There was no middle class, commerce being in the hands of the Jews, who possessed no political rights The king was elected and a figurehead, a curious feature of the constitution was the *librum veto*, which gave the power to any member of

The PARTITIONS of POLAND



the Diet to annul legislation. This alone was sufficient to make any government impossible, and the nobles were too selfish and stupid to permit a change.

A minor partition occurred in 1667, when Poland lost the Ukraine beyond the Dnieper to Russia, and the beginning of Russian interference was the first mark of the decline of Poland. What is known as the first partition was in 1772 and was deliberately planned by Frederick the Great of Prussia and Catharine II of Russia. Through their influence, Poniatowski, a Polish nobleman, was elected king. His election led to anarchy in Poland, as the enemies of that country had foreseen. This disturbed condition gave Frederick and Catharine an excuse for intervention, which resulted in the appropriation of a portion of the country by each.

The second and third partitions took place during the French Revolution. The second partition was the result of an attempt of Poniatowski to revise the constitution and abolish the *librum veto*. Catharine of Russia, fearing lest Poland should become a strong state, intervened in the interest of the nobles Frederick William II of Prussia, while refusing to aid those favoring a new Constitution, joined with Russia in again encroaching on Polish territory.

The third partition occurred in 1795. The Polish patriot Kosciusko refused to submit to the dismemberment of his country, and he led a national revolt. Poniatowski refused to support the movement, and Poland, divided against itself, fell an easy prey to its enemies. This time the armies of Russia, Prussia, and Austria entered the country. Warsaw, the capital, was occupied, the king was forced to abdicate, and all Poland was divided among the invading powers, which retained possession of their respective territories until the World War Because of the activities of secret societies and general discontent of the people, a revolution broke out late in 1830, and the Russians were driven from Warsaw and independence was declared in January, 1831. The Russians soon returned, and though the Poles fought bravely, their enemies were able to recapture Warsaw in September. Several other attempts for freedom were made, but none was successful. Russia retaliated by a drastic program of Russification. The Russian language was made official and introduced into the schools, the activities of the Catholic clergy were curtailed, and the economic affairs of the country were dominated.

Poland and the World War. In 1914 Poland was invaded by German and Austrian forces, but the invasion was checked by Russian arms before Warsaw was reached. In the summer of 1915, a German "drive" under Von Hindenburg captured Warsaw and drove the Russian army out of the country. Since the retreating Russians devastated the country, so that the enemy might derive no subsistence from it, the people were left in a most wretched condition. Their distress increased with every year of the conflict, and thousands perished of ill-treatment and starvation, in spite of heroic efforts in their behalf.

At the outbreak of the war, the czar promised Poland self-government if it would remain loyal to Russia. After the country came into the possession of the Germanic powers, the emperors of Austria and Germany, in November, 1915, issued a proclamation promising an independent kingdom of Poland, but the proclamation did not include the parts occupied respectively by Germany and Austria. These efforts to retain their interests came to naught with allied victory. The Poles proclaimed a republic in 1918, and Pilsudski became dictator as well as first provisional President. Though his radical ideas did not meet with the approval of the Conservatives, they were appeased by the appointment of Paderewski as Premier.

At the Peace Conference, Paderewski presented claims for more territory, and asked boundaries along ethnographic lines. The Treaty of Versailles, in 1919, granted to Poland on the western frontiers the greater part of Posen and some of West Prussia, left Upper Silesia with its rich mineral resources to a plebiscite, and granted Poland an outlet to the sea through a "corridor" extending to the Baltic Sea. This separation of Germany from East Prussia caused much dissatisfaction in Germany, which claimed that the eastern-frontier solution was unjust Poland answered by pointing out that East Prussia was more a colony than an integral part of Germany Danzig, the port of this corridor, was made a Free City. By a supplementary treaty, West Galicia went to Poland, and another provision of the treaty required Poland to sign a treaty guaranteeing religious freedom to minority populations, equal civil and political rights for all, and provision for use of the communication facilities by the allied powers.

Later Events. The details given indicate the background for the hostilities which followed the treaty. Early in 1919, a dispute arose with Czechoslovakia over the Teschen district, which was important for its coal and ore deposits. This dispute was settled by the Conference of Ambassadors, which gave Czechoslovakia most of the coal mines, and Poland the city. Hostilities with Russia, Poland's ancient enemy, were more serious Encouraged by the French, the Poles went to battle with an aroused nationalist spirit and a determination to reëstablish the frontier of 1772. Although apparently defeated, the Poles, led by Pilsudski, renewed the war, and unexpectedly drove the Russians back. The Treaty of Riga, which followed, granted additional eastern territory to Poland, as well as an

indemnity, guaranteed the political sovereignty and independence of both countries, and denied claims to war reparations.

On the heels of the Russian affair came a dispute with Lithuania over the question of Vilna. On April 19, 1919, Poland had occupied this town and district, and held it until the summer of 1920, when the Bolsheviks compelled them to evacuate it. By the Treaty of Moscow, Russia was required to relinquish the territory to Lithuania, and Poland pledged itself not to encroach upon Lithuanian territory. But in October of that year, General Zeligowski, with an unofficial military force, took possession of the district. Poland disavowed this step, officially, but secretly approved of it.

In 1923 the northeastern frontier of Poland was fixed by the Conference of Ambassadors, and the Vilna district was included in Polish territory. Lithuania refused to accept this decision, and continues to protest it. In the December, 1927, meeting of the League of Nations, Lithuania brought up the matter for discussion, and although the state of war which had existed between the two countries for seven years was declared ended, the Vilna question was left unsolved. Poland appears to have a rather firm grasp on Vilna, and is backed by a constantly increasing military force. Thus it is doubtful whether Lithuania will ever be successful in reclaiming the lost territory.

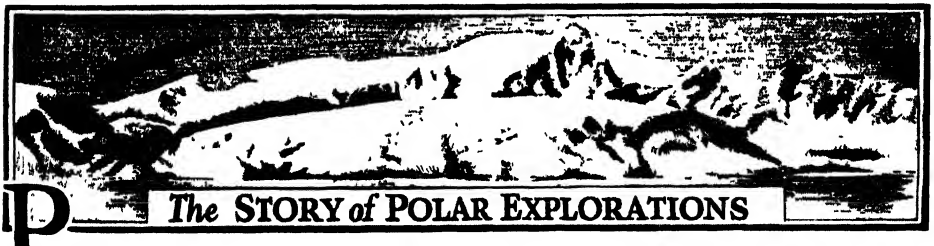
Added to Poland's political troubles have been internal problems, among these is the status of the Jews. The minority treaty guaranteed religious and educational liberties, but contempt for the Jews, with their inclination for trade and their apparent lack of Polish patriotism, caused them to be ostracized socially, economically, and educationally, and kept from exercising their political rights. The situation is improving, however, and the Jews are subjected to less injustice than formerly. The agrarian problem, which involved settling uneducated and unskilled peasants on small plots of land and teaching them to produce and market their goods, also taxed the energies of the government.

Financial embarrassment, which all the war-devastated countries faced, was particularly evident in Poland. Stabilization loans were obtained principally from the United States, and in 1924 the Polish debt to America was funded at $178,000,000, to be paid within eighty-four years, that to Great Britain was funded at £5,000,000 for a term of sixteen and one-half years. In 1925 the United States floated a $35,000,000 loan of twenty-five-year duration at eight per cent interest. The last loan of $72,000,000 was made in October, 1927, $47,000,000 of which was taken in the New York market. Charles S. Dewey, an American citizen, was named as adviser to the government and the Bank of Poland, and enjoys considerable power

There have been many changes in the government, owing to the great number of political parties, but Pilsudski made himself the real dictator in the affairs of Poland in 1926. His reorganization of the government was swift and complete

Related Subjects The reader who is interested in Poland will find further related material in the following articles in these volumes

Catharine (II, Russia)	Lithuania
Danzig	Paderewski, Ignace
Frederick (II, Prussia)	Pilsudski, Joseph
Galicia	Posen
John III (Sobieski)	Prussia
Kosciusko, Thaddeus	Silesia
League of Nations	World War



The STORY of POLAR EXPLORATIONS

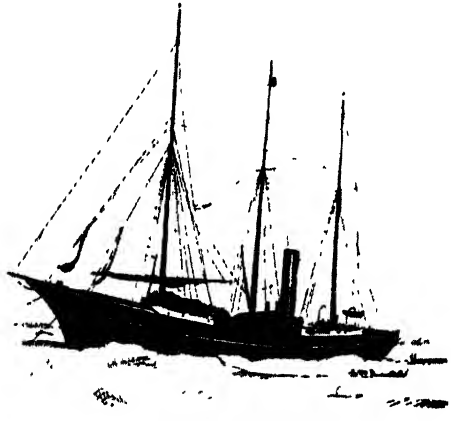
POLAR EXPLORATION. From earliest times, the Polar regions have exercised a fascination that has proved an almost irresistible call to adventurous men of many nations, who have risked and, in many cases, lost their lives in voyages of discovery. The ancients did not suspect the existence of the Poles; to them the regions of the north and south were mysterious zones of uninhabitable, frozen land and sea. Astronomical study led to the conviction that in the Polar regions the sun must shine at midnight in midsummer and not at all in midwinter. The knowledge that the earth was round appears to have been lost for a time, and in the Middle Ages, in European countries, it was considered absurd, even impious, to believe in the roundness of the earth; even scholars believed it to be flat.

When, however, the theory of the rotundity of the earth was clearly proved, attention was again more forcibly drawn to the Poles. It was always toward the north that men's thoughts turned, and vague and manifold were the traditions concerning the North Pole. Explorers set

out to search the frozen north. Centuries before attention was seriously drawn to the South Pole, the Arctic region had been visited by adventurers. The South Pole lacked the attraction offered by the search for the Northwest Passage, the account of the search for which is given at length in these volumes The final discovery of the North Pole was the result of ages of adventurous expeditions, while the discovery of the South Pole was the quick result of expert observation and scientifically prepared expeditions.

Arctic Exploration

Discovery of the North Pole. After repeated attempts by other explorers, the North Pole was sighted by Commander Robert E. Peary of the United States navy, on April 6, 1909. He, with five companions, set foot on the long-sought goal on April 7. Peary had spent nearly a quarter of a century in Arctic exploration, and his achievements entitle him to rank with the foremost explorers of his day. Peary's successful expedition left New York in the steamer *Roosevelt* in July, 1908, and on September 8 reached the most northerly inhabited



THE "ROOSEVELT"
Peary's vessel, used in his final and successful effort to reach the North Pole

point in Greenland. In command of the *Roosevelt* was R. A. Bartlett, who had had great experience in navigating Arctic seas with previous expeditions.

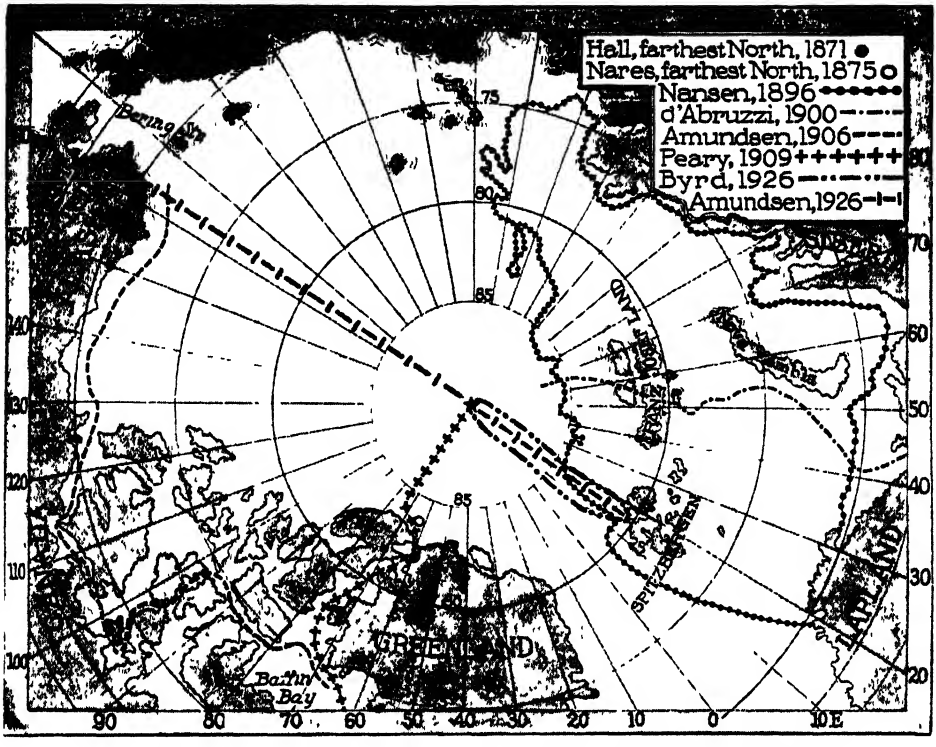
During the winter of 1908, supplies were transported to Cape Columbia, from which the final dash to the Pole was to be made. Commander Peary's long experience in Arctic regions proved invaluable. The Eskimos he had employed were picked men, who knew and trusted him; the dogs with which he was provided were the best to be obtained in Greenland.

The party left Cape Columbia in five sections. The expedition included seven white men, seventeen Eskimos, 133 dogs and nineteen sledges. Peary saved himself as much as possible for the final dash, and sent back, one after another, four of the five divisions, himself pushing on with four Eskimos and a negro assistant. On April 7 the Pole was reached; careful observations were taken to place the attainment beyond all doubt, and the return journey commenced. From Indian Harbor, which was reached on September 5, 1909, Peary telegraphed, "Stars and Stripes nailed to the North Pole"

Captain Cook's Expedition. Five days previous to the receipt of Peary's telegram announcing his success, Dr. Frederick A. Cook of Brooklyn announced in cable dispatches from Arctic lands that he had reached the North Pole a year before Peary, on April 21, 1908. This news came as a complete surprise; at first his claim was accepted as authentic, but soon, under fire of Peary and his friends, Cook's exploit was publicly questioned. Dr. Cook submitted evidence of his achievement, which was not found satisfactory. A controversy was waged for some time, Cook maintaining his right to be acknowledged as the discoverer. The University of Copenhagen, after investigation, decided that his claim was invalid. Dr. Cook did not dispute the decision, which was promptly accepted by the scientific world, leaving Peary in possession of the high honor.

Scientific Results While the discovery of the North Pole has not achieved the result long sought for—the opening up of a Northwest Passage, since this passage was discovered in 1905 by Roald Amundsen—it has accomplished much that is of value to the scientific world. The geological formation of the lands nearest to the Pole has proved the correctness of the theory long held by many that, at some time in the earth's history, the Arctic regions enjoyed a genial, if not almost tropical, climate. Almost every geological formation is represented, and the remains of plants and animals that could not have existed in any but a temperate climate have been discovered. No great mountain range runs through the Arctic region, which contains only one active volcano, on the small island of Jan Mayen. Around the Pole itself there is no continent such as exists at the South Pole. Soundings taken through the ice by Peary's party revealed a depth of 1,500 fathoms (9,000 feet), without touching bottom.

It was discovered that the temperature in the immediate vicinity of the North Pole is not as low as in surrounding territory nearer the continents. The lowest temperature ever recorded on the earth's surface is probably that experienced at Verkhoyansk in Siberia, where the thermometer registers −70° F. every



PEARY BROUGHT TO AN END CENTURIES OF ENDEAVOR (SEE COLORED MAP, PAGE 371)

winter, and sometimes shows a temperature of −93°. It has been calculated that the temperature at the North Pole seldom, if ever, goes below −40° F.; this is about the degree of cold experienced in many parts of Canada every winter. Peary reported that in the far north the ice becomes more even, and less difficult to travel on, than near the land. This would suggest that nearer the Pole the atmosphere is calmer, and not subject to the disturbing storms that render the sea ice farther south so irregular and difficult to cross.

History of Arctic Exploration. About 325 B.C. an adventurous Greek named Pytheas sailed from Marseilles, then called Massalia, on a voyage of discovery. He reached the land of the midnight sun and the Arctic Circle. Early in the ninth century, Iceland was discovered, and in the tenth century, Eric the Red found Greenland, where a settlement was established. These were, however, merely voyages of discovery, and had no direct connection with the North Pole, although they naturally turned attention to regions farther north.

Later, men devoted themselves to search for a possible passage along the coast of North America, westward to India and Asia. The first to set out to discover this passage was John Cabot, in 1497. Sebastian Cabot, Frobisher, Davis, and others followed; Barents, the great Dutch navigator, reached Nova Zembla, Hudson explored Hudson Bay and surrounding waters in 1609 and 1610. During the eighteenth century, Arctic waters were frequented by whaling vessels, but little was done in the way of scientific exploration. In 1845 an expedition set out under Sir John Franklin for the purpose of discovering the Northwest Passage. For many years no news or trace of this expedition was found, though repeated attempts were made Numerous expeditions were sent out from England and the United States to ascertain the fate of Franklin and further to explore Arctic regions.

Doctor Elisha Kent Kane, commander of an expedition for the rescue of Franklin, gave the first systematic and popular account of the Polar regions. I. I. Hayes, who had previously accompanied Kane, reached latitude 78° 17′ N., and was followed in 1871 by C. F. Hall, who penetrated to latitude 82° 11′ N., but died on his return. In 1875 Sir George Nares reached latitude 82° 27′ N., in Grinnell Land, where, later, stations were established for the purpose of making a scientific study of magnetic and climatic conditions. Nils Adolf Eric Nordenskiold sailed eastward from Tromsö toward Bering Strait, and in 1879 actually passed

Antarctic Exploration

Discovery of the South Pole. The discovery of the South Pole was achieved more quickly than that of the North Pole, but it demanded no less skill and hardihood on the part of those who sought it. The mystery of the South Pole was practically solved by an expedition under Lieutenant (later Sir) Ernest H. Shackleton in 1909, though the Pole was not reached. Another expedition was fitted out in 1910, under the command of Captain Robert F. Scott. In 1910 the Norwegian navigator, Roald Amundsen, already famous in Arctic annals, also embarked on a similar expedition. Amundsen, by a quick dash that astonished the world, reached the Pole on December 16, 1911, and returned to civilization early in 1912, with the story of his success, for which the scientific world loaded him with honors. Captain Scott and four of his companions reached the Pole by another route on January 18, 1912, a month too late to gain credit for the discovery. On the return journey, Scott and four of his companions lost their lives, after terrible sufferings from cold and hunger.

History of Antarctic Exploration. Captain James Cook was the first man known to have sailed across the Antarctic Circle. On January 30, 1774, he reached latitude 71° 10′ S., over 4° south of the Circle. Vessels sailing round Cape Horn had constantly met with adverse winds which drove them out of their course into the icy Southern seas, with the result that many of the original discoveries of Antarctic lands were accidental. In fact, all such discoveries recorded previous to 1750 must have been the result of misadventure. Alexander I of Russia, in 1819, sent out an expedition, the results of which were highly important. It consisted of two vessels under the command of Bellingshausen, who discovered land which was named Peter I Island and Alexander Land. In 1831 Biscoe started from the Sandwich Islands, now Hawaii, to look for new islands, and found Enderby Land, and in 1833 Kemp discovered Kemp Land. In 1839 Balleny discovered the islands known as the Balleny group. An English expedition under James Clark Ross in 1842 entered the Antarctic Circle in latitude 78° 10′ S., the lowest southern record until 1900. A French expedition under Dumont d'Urville found traces of what was believed to be a continuous coast from 136° to 142° E., and to it gave the name of Adélie Land.

Later Expeditions. In 1874 the *Challenger*, carrying a scientific expedition sent out by Great Britain, crossed the Antarctic Circle. In September, 1894, the Norwegian whaler *Antarctic* sailed from Melbourne, Australia, and landed a party at Cape Adare, among the first to set foot on the Antarctic continent. Borchgrevinek, the Norwegian scientist, with the British Antarctic expedition of 1898-1900, reached latitude 78° 50′ S., located the south magnetic pole, and returned with the most valuable and reliable information thus far obtained concerning the region.

In 1901 three important expeditions were sent to the Antarctic Circle by the German, Scandinavian, and British governments, respectively. Captain R. F. Scott, above mentioned, who lost his life after his successful attempt to reach the Pole in 1912, was in command of the British expedition, which had for its object geographical discovery and exploration. Professor von Drygalski was in command of the German party, with instructions to study life and magnetic phenomena. The Norwegian scientists were to study all conditions and phenomena. Captain Scott established quarters near Mount Erebus and spent two winters in the region, approaching nearer to the Pole than any previous explorer had been able to do. The German expedition, after spending one winter in scientific research, was recalled, having relocated the south magnetic pole and gained much scientific information. The Swedish expedition, led by Nordenskiold, a nephew of the discoverer of the Northeast Passage around Asia, spent two winters on the borders of the Antarctic Circle. While on the way to pick up the party, which had made a long southerly march on skis, the ship was lost, leaving the scientists in desperate condition on the ice. The Argentine gunboat *Uruguay*, however, made a brilliant dash to the rescue and brought back the entire group. Captain Scott's party returned safely in the *Discovery* in 1904.

Expeditions of Sir Ernest Shackleton. The most notable of all Antarctic expeditions up to 1908-1909 was one led by Sir Ernest Shackleton in those years. Dividing his party into three sections, Shackleton himself penetrated the interior of the Antarctic continent to 88° 23′ S., within ninety-seven miles of the Pole, when he was forced to return because of lack of supplies. Another party relocated the south magnetic pole, while the third ascended Mount Erebus. Shackleton's expedition demonstrated that the interior of the continent is a high plateau, in some places with an elevation of 11,000 feet, covered to an enormous depth with ice. In 1914 it was decided to send Shackleton south again, and though the outbreak of the World War delayed preparation, and it was thought the expedition would have to be abandoned, it finally started as originally intended.

On October 25, 1914, Shackleton sailed from Buenos Aires in the ship *Endurance*. In January the vessel became involved in a huge pack of floating ice, which carried it onward in an irregular course for months, until in October,



Photo U & U

CAUGHT IN THE ICE

A flashlight picture of Shackleton's ship, the *Endurance*, in Weddell Sea, where it sank soon after the photograph was taken One of the men is shown carrying food to the dogs, whose kennels are miniature igloos.

1915, the *Endurance* was crushed. The party had to establish quarters on the drifting ice pack, and there they remained for six months, warding off starvation by eating dogs and seals. In April, 1916, the pack began to break up, and the men embarked on the perilous sea in small, open boats. After a voyage of ten days, in which they endured incredible hardships, they landed on Elephant Island, a dreadful, glacier-covered stretch of land, exposed to the fiercest storms and without an inhabitant. With a heroism unsurpassed in the annals of Polar research, Shackleton and five volunteers set out on a relief expedition, navigating the wild sea in a small open boat. After reaching the Falklands, Shackleton made three attempts to reach the men on Elephant Island, but each effort failed. The undaunted Shackleton, however, refused to be defeated, and finally, after seventeen weeks, reached the marooned travelers, all of whom he found alive. They had eked out their scanty rations by eating penguin, shellfish, and seal.

Meanwhile a supporting expedition under Captain E. Mackintosh had sailed in the *Aurora*. The purpose of this company was to lay supply depots on Ross Barrier (see map, under ANTARCTIC LANDS) for the use of Shackleton's party. While Captain Mackintosh and several men were stranded on shore, the *Aurora* was loosened from its moorings by a terrible blizzard and was swept out to sea. After drifting in the ice for many weeks, the vessel reached New Zealand. The men left on Ross Barrier continued their work of laying supply depots. This they accomplished with almost superhuman courage, for they were beset by furious blizzards. Moreover, scurvy attacked the party and rendered some of them helpless, Captain Mackintosh and two of the men dying from the effects of the hardships. In 1917 Shackleton rescued seven men who survived. Thus ended one of the most thrilling chapters in the history of Polar explorations.

There was a renewal of interest in Antarctic exploration in the decade following, and in 1928 two significant expeditions were begun, one by Sir George Hubert Wilkins, and the other by Richard E. Byrd. On September 23 Wilkins sailed from New York with four companions, having Graham Land as his objective. Accompanying him was Lieutenant Karl Ben

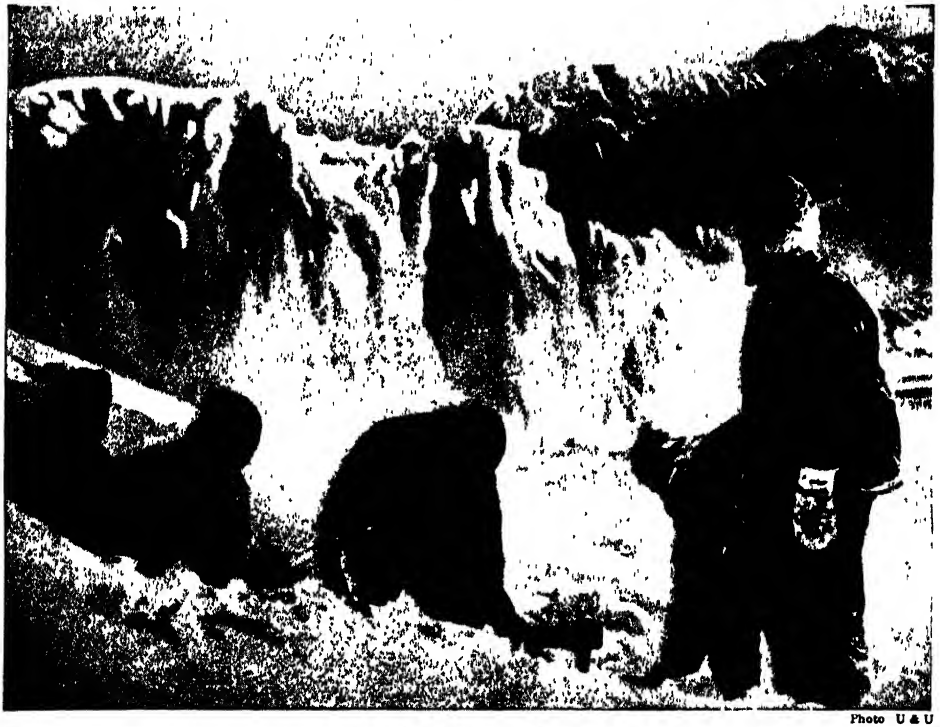


Photo U & U

TERRORS OF THE ANTARCTIC

The illustration suggests the extreme cold and the discomforts at the southern point of the earth. Here are some of Shackleton's men digging a shelter from the wind during a blizzard. Note the mountains of ice in this most desolate of all parts of the world

Eielson. At Montevideo, Uruguay, the five men boarded a whaler bound for Deception Island, situated between Antarctica and Cape Horn, where they established their base. Wilkins made airplane flights from Deception Island, in the hope of finding desirable places for the establishing of meteorological stations. His discovery of the island-like character of Graham Land was a significant result of this expedition. Instead of there being a continuous mass of land and land ice, Graham Land is separated from the main Antarctic continent. Between them is an ice-covered strait. Captain Wilkins made this discovery in a 1,200-mile flight from Deception Island.

On the other side of the Antarctic, Commander Byrd conducted one of the best-equipped expeditions that ever went out—a $1,250,000 venture in which every modern device was included to ensure the success of his scientific program. On October 10, the whaler *C. A. Larsen* pushed away from a flag-draped dock at San Pedro, Calif., and began the journey destined to take Commander Byrd on his Antarctic mission of "filling in the blank spaces of the map." Most of the equipment for the seventy-five scientists, engineers, aviators, and others making the projected two-year trip was aboard three other ships which were already on their way to Dunedin, New Zealand—the *Edith Bolling*, supply ship, so named in honor of Byrd's mother; the whaler *Sir James Clark Ross*; and the ice-breaking sailing ship *City of New York*, the flagship. The planes included a tri-motored, all-metal Ford monoplane, the *Floyd Bennett*; a Fairchild cabin plane, the *Stars and Stripes*; a Fokker Universal, the *Virginia*; and a small three-place monoplane. These planes were to be sent out from the base of operations, the Bay of Whales. They were supplemented by 100 dogs and dog sledges, as well as tractors for ice-land travel.

All the members of the expedition went aboard the *City of New York* at Dunedin, and later sailed southward, bound for the Ross Ice Barrier, adjoining the Bay of Whales. They reached this base on December 26. Commodious headquarters, called Little America, were established on the ice. After the rigors of a terrible winter, Byrd and three companions, on Thanksgiving Day, 1929, flew to the South Pole, and on the journey made discoveries of great importance to science.

Related Subjects. These volumes contain much information that will be of interest in connection with the

subject of Polar exploration. The reader is referred to the following articles

Abruzzi, Duke of the	Kane, Elisha Kent
Aircraft	MacMillan, Donald B.
Amundsen, Roald	Nansen, Fridtjof
Antarctic Lands and Seas	Nobile, Umberto
Arctic Lands and Seas	Nordenskiold, Nils A E
Byrd, Richard E	Northwest Passage
Cabot, John and Sebastian	Parry, Sir William E
Challenger Expedition	Peary, Robert E
Cook, Frederick A.	Ross, Sir James Clark
Cook, James	Scott, Robert Falcon
Franklin, Sir John	Shackleton, Sir Ernest H.
Frobisher, Sir Martin	Stefansson, Vilhjálmur
Hudson, Henry	Wilkins, Sir George H.

POLARIMETER, *po lahr im' e tur.* See POLARISCOPE.

POLARIS, *po la' ris* See POLESTAR, NORTH STAR.

POLARISCOPE, *po lair' ih skope,* an instrument for producing and testing polarized light. It consists of a polarizer and analyzer, mounted so that they can be rotated on a common axis and be several inches apart, in order that the crystal or substance to be studied may be placed between them (see figure). In the better instruments, Nicol prisms are used in both polarizer and analyzer In the cheaper instruments, the Nicols are replaced by piles of glass plates This type of instrument never gives completely polarized light. When a polariscope is equipped with a graduated circle, so that the angle through which the analyzer is rotated can be accurately read, the instrument is usually called a *polarimeter.*



THE POLARISCOPE

Saccharimeter, an instrument for measuring the sweetness of a sugar solution by finding out how much the solution will rotate the plane of polarization of a ray of light passing through it. The sugar solution is placed in a tube of convenient length and having glass ends, so the light ray which passes through the polarizer may pass through the solution in the tube before it strikes the analyzer If the polarizer and analyzer are crossed before the tube is placed between them, no light can be seen when one looks through the analyzer. When the tube is placed between them, the solution rotates the plane of rotation of the light passing through the polarizer, and it can then pass on through the analyzer. If the analyzer is then rotated until the light is again cut off, the angle through which the sugar solution has rotated the plane of rotation is at once determined. This angle, together with the length of the tube (the length of the path through the solution), enables one to calculate the percentage of sugar in the solution. See POLARIZATION OF LIGHT. A.L.F.

POLARITY OF MAGNETS. See MAGNET AND MAGNETISM.

POLARIZATION, *po lahr ih za' shun,* **OF LIGHT** is the limitation of light waves to a single direction. If we watch the motion of some floating object, say a box, as the waves roll in over a lake toward shore, we note that the box bobs up and down as the waves pass by it. This means, of course, that the water under the box is doing the same thing. The waves may roll in toward shore all day, and the water not be any deeper in the evening than it was in the morning The motion of the water is oscillatory and in a vertical plane. But if we observe the motion of a limb on a tree when a gusty wind is blowing, we see that it oscillates back and forth in a horizontal plane. Now, if we could see the motions of the ether as a light wave is approaching our eye, we would observe that, in general, the vibrations that produce light waves are not confined to a single plane. They may be said to be taking place in all planes. There are several ways, however, in which we may cause the vibrations to take place in one plane only, in which case we have plane-polarized light. Plane-polarized light is, therefore, light whose vibrations take place in one plane only.

Methods of Polarizing Light. Common light may be partially or completely polarized in several different ways, of which three will be briefly described:

Polarization by Reflection and Transmission. Suppose that a ray of light strikes the surface of some body, say a plate of glass, obliquely. We can very well imagine that the vibrations which are parallel with the surface are reflected more easily than the vibrations which are taking place perpendicular to the surface. This means, then, that if we examine the reflected light, it will contain an excess of light whose vibrations are in the plane parallel with the glass surface, which means that the reflected ray is partially polarized. It is evident that the transmitted beam would likewise contain an excess of light vibrating at right angles

to the surface of the glass, and therefore it, too, would be partially polarized. The polarization can be made more nearly complete, but never entirely complete, by using a number of glass plates—a pile of them.

Polarization by Absorption. Some substances, tourmaline being a notable example, have the peculiar property of absorbing waves whose vibrations take place in a certain plane

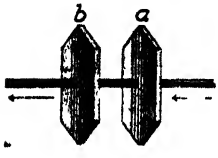


FIG 1

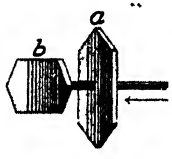


FIG 2

In the first figure, light is passed through tourmaline crystals *a b*. In the second figure, light is cut off by crossed tourmaline crystals.

and transmitting those that take place in planes at right angles to the absorbing plane. Evidently, then, when common light is passed through such a crystal, the emergent light will be polarized. The only drawback to the use of such crystals for polarizing light is that they usually are colored; that is, they do not transmit all of the components of white light.

Polarization by Double Refraction. When a ray of light passes obliquely from one medium into another in which it travels at a different rate, the ray is bent, or refracted. Iceland spar is a crystalline substance which has the peculiar property of permitting light to pass through it at a certain velocity if it is vibrating in one plane, and at a different velocity if it



FIG. 3

is vibrating in a plane at right angles to the first. Consequently, when a ray of light strikes such a crystal, it is divided into two parts, one of which is bent, or refracted, more than the other, because it does not travel as fast as the other. After passing through the crystal, these two rays of light have been separated because of this double refraction; the light in one of them is vibrating in one plane, and that in the other is vibrating in a plane at right angles to the first. Since a crystal of Iceland spar is transparent to waves of all color, and since the two beams of light that go through such a crystal are completely polarized, the one in one plane and the other in a plane at right angles thereto, the use of such crystals is far preferable to any other means of obtaining polarized light. By sawing in two a crystal of Iceland spar in a certain direction and cementing the two parts together with Canada balsam, one of the beams of polarized light may be gotten rid of by total internal reflection, leaving light polarized in one plane only to get through. Such a crystal is called a Nicol prism. All high-grade polarizers and analyzers are of Nicol prisms.

Rotation of Plane of Polarization. There are certain substances, of which quartz is an example in the case of a solid, and a sugar solution of a liquid, that have the strange property of rotating the plane of polarization of light as it passes through them. This means that a light wave whose vibrations are in a certain plane as the light enters the substance will emerge from the substance with vibrations in a totally different plane. Dextrose sugar rotates the plane of polarization to the right, and levulose sugar to the left, the amount of rotation depending on the percentage of sugar in the solution. See *Saccharimeter*, under POLARISCOPE. A.L.F.

POLDER, *pole' dur.* See NETHERLANDS, THE (Industries); BELGIUM (Physical Features).

POLE, as a geographical term, is either end of the axis about which the earth rotates daily. One pole, ninety degrees north of the equator, is called the North Pole; the South Pole occupies a corresponding position at the southern end. Astronomers use the term *celestial pole* to designate that point in the heavens at which the earth's axis points, and about which the stars appear to revolve. The star nearest this point in the northern heavens, called North Star and polestar, is used by sailors in locating direction at sea.

In a broad sense, the term *pole* may be used to designate a point on any sphere situated as the earth's poles are to to the equator. Thus, the poles of the horizon are the zenith and the nadir.

In physics the term is used to designate the points of a body at which its attractive or repulsive force is concentrated. The magnetic poles of the earth are points on the surface where the magnetic needle is vertical, or upright. R.H.W.

Related Subjects. The reader is referred in these volumes to the following articles

Astronomy (The Stars and Their Names)	Nadir
Magnet and Magnetism	North Star
	Zenith

POLECAT, an animal belonging to the weasel family, closely related to the skunk of North America. It was once widely distributed throughout Europe, but is now being exterminated in many places because of its destructive

habit of feeding on domestic fowl of various sorts, as well as on rats, mice, eggs, and wild birds. In common with the skunk, it secretes, and can discharge at will, a liquid of a most disagreeable odor. The common variety is about seventeen inches long, with a tail six inches in length. Its long, loose, dark-brown fur is marketed under the name of *fitch*. The American skunk is sometimes incorrectly called polecat. See the articles SKUNK; WEASEL. M.J.H.



Photo U & U

THE POLECAT

Scientific Name. The polecat belongs to the family *Mustelidae* Its scientific name is *Mustela putorius putorius*

POLEMARCH, *pol' e mahrk*, in ancient Greece, a war archon (which see).

POLES OF MAGNETS. See MAGNET AND MAGNETISM.

POLESTAR, OR POLARIS, a name given to the North Star, the brightest in the constellation Ursa Minor, or Little Bear. It is described in the article NORTH STAR, and its position is shown in the illustrations accompanying the article ASTRONOMY. F.B.L.

POLE VAULT, a sport in which the players leap over a horizontal bar with the aid of a pole. The aim is to clear an easily dislodged bar supported by two uprights. The vaulting pole, made of light, tough wood, is from thirteen to fifteen feet in length. The vaulter, having measured the height of the bar, takes an undergrip with his right hand about six inches above this point. The left hand, with an undergrip, seizes the pole at a little over a foot below the right. The vaulter approaches the crossbar at a run, rests the end of the vaulting pole in the turf about eighteen inches from the bar, and lifts himself into the air while thrusting his legs forward with the aid of the pole. He must go over the bar without dislodging it. The world's amateur record for this event, made in 1928, was thirteen feet nine and eleven-sixteenths inches (height of vault).



Photos U & U

POLE VAULT AT A HEIGHT OF THIRTEEN FEET TWO INCHES

POLICE. "Bobbies" in London and "coppers" in the United States are the popular names for the uniformed individuals of the organized body or force which enforces law and order. Although this object remains the same to-day as when the police force was first created, our complex life has extended and diversified its functions and duties.

In England and France, organized police systems were established by monarchs as instruments of despotic governments, and Russia under the old régime maintained a secret police force which spread terror instead of confidence. However, during the early nineteenth century, the United Kingdom and France instituted much-needed reforms, and the result has been police systems developed for the purposes of public welfare. Organization of the police force differs in the various countries of Europe, but control is usually directly or indirectly under central authority. It is a general practice in Europe for the central government to defray a part of the cost of administration of the police. In most European countries, a state police is maintained and is

under immediate control of the central government. It is generally modeled after the French *gendarmerie*, which is a part of the regular army.

In the United States and Canada, on the contrary, the police is under the control of the municipal authorities and is organized as a part of the local government. The state police, a body organized under state rather than local authority, is a more recent successful development in the United States (see below).

Organization in the United States. The patrolman who is seen walking his "beat," a given district of territory, is the private of the police force. Patrolmen in a police district or precinct form a detachment, at the head of which is a captain. Ranking between the captain and patrolmen are lieutenants, sergeants, and roundsmen.

In larger cities a number of police districts are under the control of inspectors, who are in turn responsible to an appointed chief of police. The chief, superintendent, or commissioner, whatever title he may bear, is the executive head of the police administration and is responsible for the character of the police service.

Shrewdness and an ability to detect crime, as well as knowledge of noted criminals, are the qualities required of men in the detective bureau. To the romantic, a glamour surrounds the powerful cars filled with determined men cruising watchfully along side streets or tearing down boulevards to the sound of a siren. A new development in the detective bureaus of several cities is a system of communication by radio between headquarters and the cruising squad cars.



Photo Wide World

POLICE DOG ASSIGNED TO A PLEASANT DUTY

Police duties are no longer confined to prevention and detection of crime. Activities which come under preservation of order are traffic regulation, inspection of buildings and sanitary districts, and, in larger cities, censorship of places of amusement, plays, films, and even books. Mounted policemen on horse or motorcycle help in traffic regulation, and harbor policemen in fast boats patrol the ports of coastal cities. In some cities, stations called *fixed posts* are maintained. A policeman assigned to such a station remains on duty there during the period of his watch, and is not supposed to leave it at any time without permission. The periods of duty vary for different towns.

State Police. With the rapid development of semi-rural communities, the express-train speed of the modern automobile, the increasing mileage of hard-surfaced roads, and other factors which bind distant points more closely together, there is increasing need of constabulary forces whose field of operations shall broaden with the extension of means of communication. City police and village peace officers can operate only within their corporate limits; outside of the boundary lines of their towns, they are merely private citizens. County sheriffs and their deputies have no authority beyond their county lines. They may chase fleeing criminals anywhere within their jurisdiction, but not another rod can they go officially.

This era of rapid transportation makes it possible for law-breakers to commit serious depredations and take flight in high-powered automobiles. It may be but a few miles to the county line, and escape may be effected before officials at a distance can be notified. On a highway, bandits may plunder and make their escape. The state police, a body usually organized on a military basis, can be widely distributed for patrol duty and quickly mobilized for emergencies. Many states have followed the example of Pennsylvania, which was one of the first states to maintain a large, well organized state police force. Canada has its Royal Canadian Mounted Police (which see).

POLICE DOG, a dog trained to help police departments by assisting in arrests, protecting officers in case of attack, running down clues, and tracking criminals The name refers to no special breed, though some breeds show special aptitudes for this work, such as the Airedale terrier, German shepherd dog, and bloodhound. A good police dog would be medium-sized, active, intelligent, quick in offense or defense, possessed of keen scent, provided with a coat resistant to weather, and excelling in faithfulness and reliability. The best-trained and finest police dogs are found in Germany, where the schooling of these animals has been standardized and brought to a high degree of perfection. The success of the system in Europe has awakened great interest in America, and the use of dogs for police duties has been adopted in a number of cities. See DOG.

M J.H.

POLISH SUCCESSION, WAR OF THE. See SUCCESSION WARS.

POLITICAL ECONOMY. See the article ECONOMICS, pages 2098-2101.



POLITICAL PARTIES. Although a political party is not a part of a government, yet it is in fact a second or unofficial government. The party in power at any one time is actually directing the legal machinery of the nation. The President of the United States or the Premier of the Dominion of Canada has been, with few exceptions, the recognized leader of his party. If he has not been recognized as the leader, he has usually failed to carry through important legislation, and has, perhaps, failed in attaining most of his other objects. The party system, therefore, is sometimes described as a link between the executive and legislative branches, for the executive's success in office depends on his identification with his party.

Political Parties in the United States

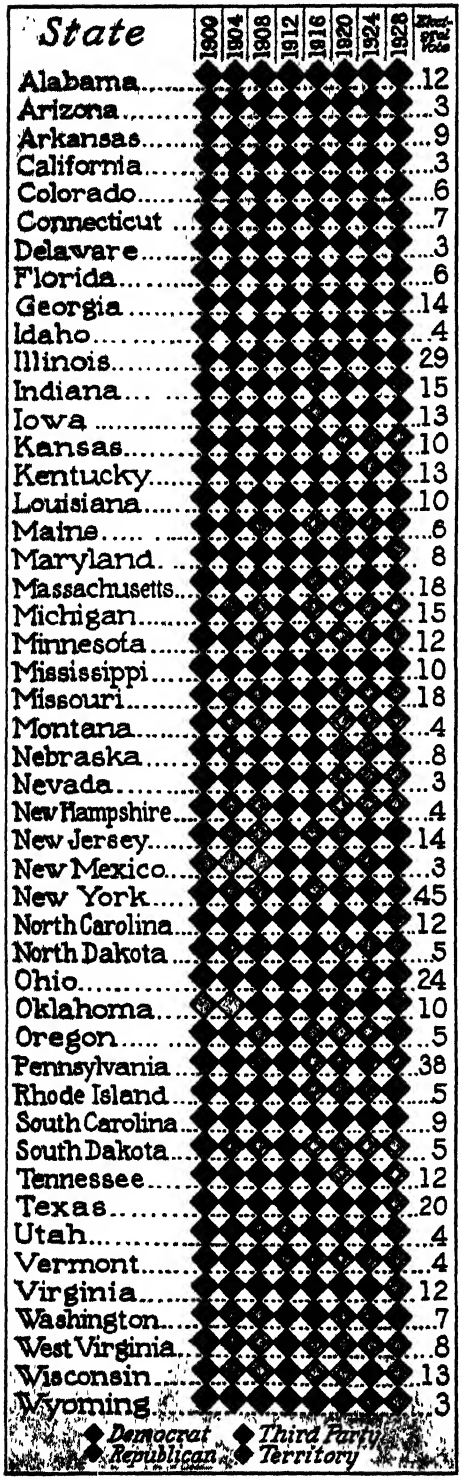
The party system in the United States has five main objects, or lines of action. Briefly stated, these are as follows: (1) to influence government policy; (2) to form public opinion; (3) to win elections; (4) to choose between candidates for office; and (5) to procure salaried posts for party leaders and workers. One of these, the last, is not always admitted as an object, and especially in recent years it has met strong opposition. The fourth of these objects, the election of public officers, is almost entirely peculiar to the United States. In no other country are as many officials chosen at the ballot box as in the United States. With comparatively few exceptions, every public officer in the United States, from the President to the village constable, is elected by a party vote.

So widespread, indeed, is the party system, that it may be said without exaggeration that all elections, even those which have nothing to do with national issues, are yet determined on a basis of national party labels. For example, Republican county commissioners will probably be elected if the county gives a majority of its ballots to the Republican candidate for President. This does not mean that the Republicans will be better commissioners because they believe in a high protective tariff, but merely shows to what degree the party spirit has permeated American life. There is, to be sure, a new and refreshing tendency toward independence in politics, but the chances are still much against the independent candidate and in favor of the "regular" man.

The hold which national political parties have on the mass of voters has tended to the slow effacement of state and sectional lines, because it has emphasized national issues. It has thus helped the nation to overshadow the states. On the other hand, the party system has thrust great power into the hands of local "bosses," or managers—men who have been able to make themselves leaders in their party. Such men, by invoking party discipline, have often managed to elect inferior or even dishonest men to high office. For the sake of electing a President, men have often voted for all the candidates of a party, and thus have placed in power men less worthy than candidates of another party. The party system, as applied to local issues and offices, has been a fruitful source of misgovernment.

Machinery of Parties. If it is granted that the parties operate the government, then, it may be asked, who controls the parties? In the opinion of James Bryce, probably the best-known commentator on American institutions, control is divided among three groups: first, the individual leaders, who have risen through talents or ability to positions of influence; second, rich men, whose money donations enable them to share in the party's councils; third, the mass of citizens, who usually follow the lead of the two other groups, but occasionally revolt. When Bryce made this classification, three decades ago, there was more reason for it than there is to-day, for now the rich man, merely as such, is almost negligible as an influence in politics.

Permanent Organization. The permanent organization of the great political parties is effected through committees. There are com-



HOW THE STATES VOTED FOR PRESIDENT

A record of results of the Presidential poll from 1900 to 1928.

mittees for every political unit, including the nation, state, county, township, city or town, and even the precinct. Each committee is independent in purely local matters, but for general party purposes is subordinated to the committee of the next larger unit. Thus, the county committee is subordinate to the state committee, which in turn is responsible to the national committee.

The primary purposes of such committees are legitimately to raise and spend money, to add to the strength of the party by getting recruits, to manage election campaigns, and generally to conduct all business pertaining to the party. The committees also determine the time and place at which some temporary organizations work in the interests of the party.

Temporary Organizations. These are the conventions and primaries. A convention is a meeting of delegates, who are chosen by districts, for the purpose of nominating candidates for office and adopting a party platform. In fixing the methods by which members of such conventions are chosen and by which they are organized and do business, the various party committees have an important, and sometimes the sole, voice. A primary is nothing more or less than an election, within a party, of a candidate to oppose the candidate of some other party or parties. Theoretically, all members of a party are entitled to vote at a primary. In the rural districts this is a simple undertaking, for everybody is known to everybody else, but in the cities the party managers often keep lists of voters who are "regular" and are entitled to vote at party primaries. The primary is a recent addition to the American political system, and has already proved its worth, not merely in local elections, but also in Presidential contests. When a primary is a meeting of all the voters of a party in a district, it is called a *caucus*.

History of Political Parties in the United States. During the colonial period, political parties, as the term is now understood, did not exist. The issues which divided the people were centered about the relations of the colonies to the mother country, and upon these there was at first little difference of opinion. About the middle of the eighteenth century, however, after England began to develop a more rigid and harsher colonial policy, two factions arose in America. One favored, or at least was willing to yield to, the attitude of the home government; the other declined to obey, and demanded a constantly increasing degree of self-government. About 1760 the latter began to call themselves *Whigs*, because of the gratitude which they felt toward the Eng-

lish Whigs; while the former were known as *Tories*. During the course of the Revolutionary War, large numbers of the Tories left the country, returning either to England or crossing the border into Canada, where, as United Empire Loyalists, they had a conspicuous share in developing that great country.

Parties Under the Confederation. From the beginning of the Confederation, there were differences of opinion about the new government. One faction, consisting chiefly of those who lived in rural districts, favored a loose confederacy, in which the individual state was to retain all the powers of sovereignty except the minimum required for the limited coöperation of all the states. Such an experiment in government was actually tried under the Articles of Confederation. Another faction, which steadily increased in influence as the weakness and inefficiency of the Confederation became apparent, demanded that the central government be granted all the essential powers of sovereignty and that there should be left to the states only the powers of local self-government. The latter faction, although not organized as a party, gained such strength that a convention was called to adopt a new Constitution.

Origin of Parties Under the Constitution. In the Constitutional Convention of 1787, in Philadelphia, the two parties fought out their differencies, with the result that the Constitution, though wholly satisfactory to neither faction, vested far greater powers in the central government than did the old Articles of Confederation. The first real party organization developed soon after the inauguration of Washington as President. Washington was elected, not as the head of a party, but as the choice of the people as a whole. His Cabinet included men of both factions. Hamilton was the leader of the Nationalists, later called *Federalists*; Jefferson was the spokesman for the *Anti-Federalists*, who were later known as *Republicans*, *Democratic-Republicans*, and finally *Democrats*. For twelve years the Federalists were in power, and the Anti-Federalists had little to do but criticize. During those twelve years, however, popular distrust of the Federalists became strong, partly owing to the frankly expressed opinions of Hamilton and John Adams, who praised the monarchical form of government, and partly because of the influence of the French Revolution. The result of this distrust was the defeat of the Federalists in 1800, and the seating of Thomas Jefferson in the President's chair in 1801.

Sixty Years of Democratic Supremacy. From 1801 to 1861 the Democratic party was the majority party. It lost, to be sure, three elections, those of 1824, 1840, and 1848, but these were all in the nature of political accidents. During this period the Democratic party underwent a double change. First, it disregarded its old principles, and for a time adopted the policy of liberal construction of the Constitution, but after slavery became the predominant political issue, it again became the party of strict construction. Opposing the Democratic was the Federalist party, which was succeeded by the Whigs. When the Whig party split hopelessly in an attempt to hold Southern pro-slavery and Northern anti-slavery men together, its place was taken by the present-day Republican party. There were during this period a number of minor parties—the Anti-Masons; the Liberty party, led by James G. Birney; the Free-Soilers, an offshoot of the Whigs; and the American, or "Know-Nothing," party. Each of these minor parties had a brief independent existence, although its principles may have survived in the two great parties.

Period of Republican Domination. In the critical year preceding the outbreak of the War of Secession, the Democratic party was split into Northern and Southern wings. The former, during the war, was allied with the Republicans in the so-called Union party. After the war, the Southern Democrats suffered from the errors of the reconstruction period and remained the minority party, the Republicans maintaining the ascendancy. With the exception of Grover Cleveland, no Democrat was elected President until 1912, forty-seven years after the surrender at Appomattox Courthouse. In 1913 Woodrow Wilson began an administration that lasted for eight years, but the Republicans regained power in the election of 1920.

As in the half century preceding the War of Secession, minor political parties continued to bid for popular favor; some of them threatened for a brief time to become major parties. Among these were the Liberal Republican; the Greenback, or National; the Prohibition; the Socialist, or Socialist Labor; the Populist; the National Democratic; and two Progressive parties—one led by Roosevelt in 1912, and the other by La Follette in 1924. The noteworthy feature of these minor party movements is the fact that nearly all of them had their origin, or derived their greatest strength, in a discontent with social and economic conditions rather than with the purely political matters which had previously been considered by national parties. Almost all left an impress on politics.

Since the World War, there has been a gradual lessening of sharp distinctions between the policies of the Republican and the Democratic parties, although the two have continued to be the major parties in both local and national affairs. The chief difference between them has been as to the methods to be employed in accomplishing a given result. Economic rather than purely political questions have continued in the forefront of attention.

The election of 1928 was noteworthy because, for the first time since the War of Secession and reconstruction days, the traditional "Solid South" was broken up. Of the states included in this group that had without exception given their electoral vote to the Democratic party for more than sixty years, Virginia, North Carolina, Florida, and Texas chose Republican electors. Tennessee, Kentucky, and Maryland also voted Republican, but each had done so in at least one previous contest. In this election, too, the religious issue played a considerable part. E.D.F.

Political Parties in Canada

The Canadian system of party organization is modeled closely on that of Great Britain. Canada has responsible government, which means that the executive and legislative branches of the government are properly coordinated. The contrary is true in the United States, where the President may be, and frequently is, of a different political faith from the prevailing majority in Congress. In Canada therefore, both in Dominion and provincial politics, the control of the legislative branch is the object desired. The control of executive appointments, except in so far as these are determined by the Crown, is then in the hands of the legislative majority.

In both the Dominion and provincial parliaments it is customary for each party to elect its leader. The leader of the majority party becomes Premier; the leader of the minority is recognized as the head of the opposition. The Cabinet becomes, in fact although not in name, a committee of the party in power for the purpose of carrying on the government. It is also, of course, a committee to govern the party. A similar concentration of authority exists in provincial affairs. For the most part there have been only two major parties in Canada, although, from time to time, a third or even a fourth party has been influential.

Origin and Development of Parties. Political parties in Canada were first formally organized after the War of 1812. In the decade following the war, there arose in Upper Canada a sharp division between the ruling political class and a vigorous group of reformers. The latter were aroused by the pride and power, both socially and politically, of the small group of Tories who were known as the "Family Compact." The opposition demanded responsible government, substantially as it was known in England. Conspicuous among the reformers were William Lyon Mackenzie and Robert Baldwin. In Lower Canada, too, there was a demand for greater popular rights. There the leader of agitation was Louis J. Papineau.

The Rebellion of 1837, although it resulted in the granting of specific reforms, did the general cause of reform considerable harm, for the rebellion was an unreasonable outburst. More moderate reformers, including Baldwin and Lafontaine, gradually drew away from the radicals, and by 1849 new party alignments were clear. The Baldwin Reformers were gradually absorbed by the Liberal-Conservative party, later known merely as the *Conservative* party, of which Sir John A. Macdonald was the leader. The Conservatives, on the other hand, also displaced or absorbed the reactionary Tories of earlier days.

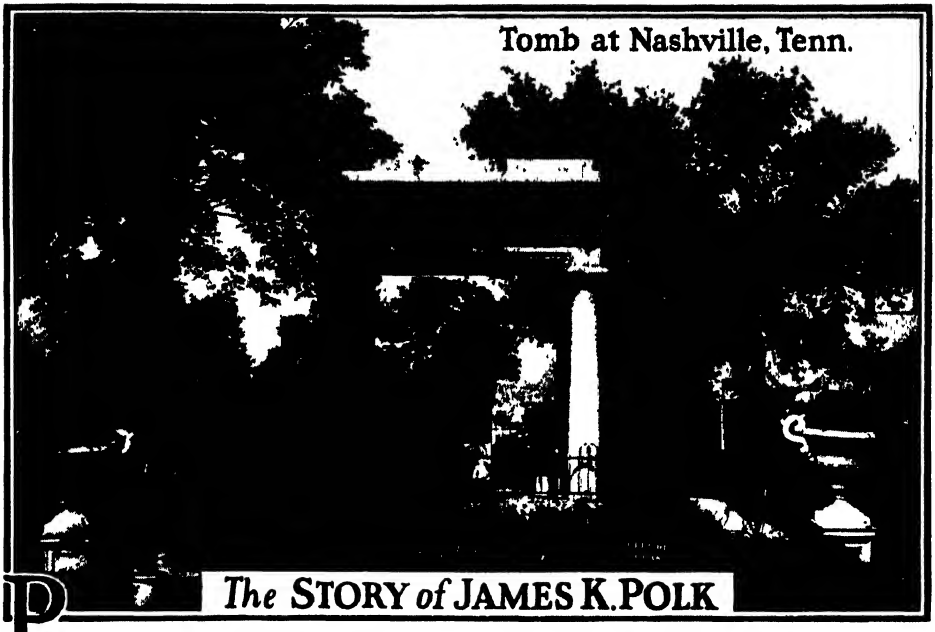
Between 1850 and 1867, there were two powerful minor parties, the "Clear Grits" in Upper Canada, and the Rouges ("Reds"), or Parti Rouge, in Lower Canada. These were both radical parties, and in a general way had similar aims. The Rouges, however, went farther than the Clear Grits in demanding the repeal of the Act of Union of 1841. Among the leaders of the Rouges were Papineau and A. A. Dorion. These minor parties disappeared from view with the coming of Confederation, and for a long time after 1867, there were only the two great parties, the Conservative and the Liberal. There was also in Quebec the French Nationalist party, which was powerful in the province and exercised a considerable influence in Dominion affairs, but it did not attain the rank of a national political party. In matters of principles, broad distinctions between the Liberals and Conservatives are difficult to make, although the former are more inclined toward a support of provincial privileges and commercial reciprocity, while the latter advocated federalism and a preferential tariff for all parts of the British Empire.

The two-party system which prevailed before and since Confederation was unsettled after the World War by the rise of a new political group, the Farmers', or Progressive, party. It developed great strength in the Western provinces, and has been a prominent factor in all recent elections. The Progressives' position is one of independence of both old parties. They are pledged neither to uphold nor to defeat any government, but will support or oppose particular measures upon their merits, judged by Progressive standards.

The Labor party has never been strong in Canada, but it has sometimes obtained important influence by joining with the Liberals on certain issues. G H.L.

Related Subjects. The following articles in these volumes should be consulted in this connection:

Abolitionists	Liberty Party
Anti-Federalists	Loco-Foco
Conservative	Nihilists and Nihilism
Constitutional Union Party	Populist Party
Democratic Party	Progressive Party
Federalist Party	Prohibition Party
Free-Soil Party	Republican Party
Greenback Party	Socialism
Know-Nothings	Tory
Liberal Republican Party	United States (History)
Liberal Party	Whig



The STORY of JAMES K. POLK

POLK, *pohk*, JAMES KNOX (1795-1849), an American statesman who was chosen to be the eleventh President of the United States His administration is one of the most noteworthy in American history, because of the Texas and Oregon questions and their solutions The Texas question developed the Mexican War and annexation of the state to the United States; the Oregon matter ended in addition of territory in a peaceful manner. Polk's attitude toward these questions was largely responsible for his nomination and election to the Presidency, and the solutions reached were largely his work.

As a man, Polk was a thinker and a student. He was tenacious of the opinions which he had formed, and was not easily moved by argument or public clamor. His private life was simple, and his home circle provided most of his amusements. George Dallas, Vice-President while Polk was President, described him as—

> Temperate, but not unsocial, industrious, but accessible, punctual, but patient, moral, without austerity; devotional, though not bigoted.

George Bancroft, the historian, who was a member of his Cabinet, wrote about Polk thirty-eight years after his death, as follows·

> Prudent, farsighted, bold, exceeding any Democrat of his day in his undeviatingly correct exposition of democratic principles; and, in short, as I think, judging of him as I knew him, and judging of him by the results of his administration, one of the very foremost of our public men, and one of the very best, most honest, and most successful Presidents the country ever had.

His Boyhood and Youth. James Knox Polk was born on November 2, 1795, in Mecklenburg County, N. C. The Polks, who originally spelled their name *Pollock*, were of Irish origin. Samuel Polk, in the fourth American generation of the family, was a North Carolina farmer of more than average intelligence. In 1806 he removed with his family to the fertile valley of the Duck River, a tributary of the Tennessee. There he made a new home in the section which was included a year later in the county of Maury, Tenn. Samuel Polk, in addition to working on his farm, also worked from time to time as a surveyor. Of great assistance to him was his son James Knox, who was eleven years old when the family moved to Tennessee. Young James not only assisted in the management of the farm, but often accompanied his father on the latter's surveying trips.

James was a studious boy, went to school for several years, and from 1813 to 1815 was in charge of a private tutor In the latter year he entered the sophomore class of the University of North Carolina. At the university he was no less studious and industrious than he had been at home. When he was graduated in 1818, he was without question the best scholar in his class in mathematics and the classics, and was chosen to deliver the Latin salutatory. It is interesting that his *alma mater*, many years later, when he was President of the United States, gave him the honorary degree of LL.D.

His Career as a Lawyer. In 1819 Polk entered the law office of Felix Grundy, then the foremost lawyer in Tennessee. After a year

he was admitted to the bar, and at once established himself in independent practice at Columbia, the county seat of Maury County. His success was immediate, and with occasional breaks caused by his political activities, Polk

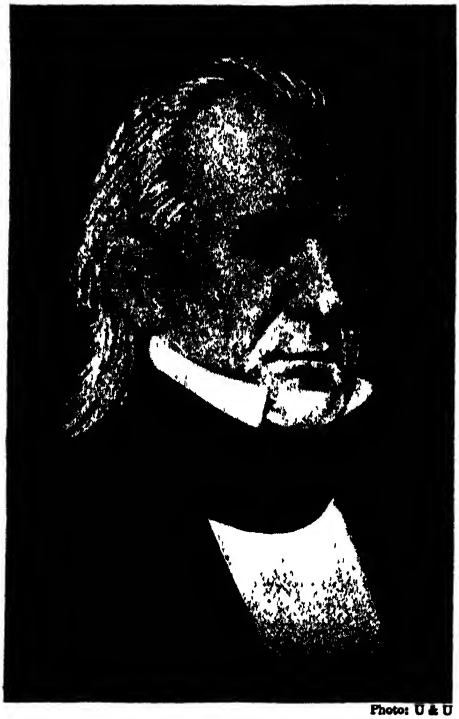


Photo: U & U

JAMES KNOX POLK

continued to practice until his election in 1839 to the governorship of Tennessee. At one time his law partner was Gideon J. Pillow, later famous as a Confederate general.

As a Lawmaker. Polk's high reputation at the bar was both a cause and a result of his activity in political affairs. He early began to expound the principles of the Democratic party, and soon won the nickname "Napoleon of the Stump." His speeches were argumentative rather than rhetorical—that is, they convinced his hearers by clear reasoning and simplicity of statement. After a brief service as chief clerk of the state house of representatives, Polk served a term in that body (1823-1825). There his reputation was further enhanced by his keenness in debate, his tact, and perhaps above all, his industry. One of the laws which he introduced and helped to pass prohibited the practice of dueling; unlike most of the prominent men of his day, he was never involved, either as principal or as second, in a duel.

When Polk first took his seat in the Federal House of Representatives, in 1825, he was one of the youngest members of that body. After two years he was placed on the important Committee on Foreign Affairs, and shortly afterward was given a place on the Ways and Means Committee. As a member of the latter committee, he prepared, in 1833, a minority report unfavorable to the Bank of the United States, an action which led to much criticism from his constituents. During the long controversy over the Bank, and in fact during the whole of Jackson's two terms, Polk was one of the President's leading supporters. In 1835 the House elected him Speaker. He remained in this position until 1839; during these four years, partisan feeling ran higher than it had ever run previously.

During Polk's first session as Speaker, more appeals were taken from his parliamentary decisions than were ever known before, but his rulings were almost invariably sustained by the House. There is, too, the testimony of John Quincy Adams, who said that the Speaker, although opposed to the anti-slavery doctrines of Adams and his friends, extended to him "every kindness and courtesy imaginable."

Governor of Tennessee. In 1839 Polk refused renomination for Congress to become the Democratic candidate for governor of Tennessee. The Democratic party had recently been deserted by John Bell and other leaders, and the election of the Democratic candidate seemed hopeless. Polk, however, was chosen by a majority of 2,500. His inaugural address included references to many national problems which were then disturbing the public mind. Polk believed that the Federal government had no right to tax the people, through customs duties or any other means, for a greater amount than was necessary to the maintenance of the government. He also remarked that "the agitation of the Abolitionists can by no possibility produce good to any portion of the Union, but must, if persisted in, lead to incalculable mischief." In 1841 and 1843 Polk was again a candidate for governor, but was defeated both times by James C. Jones, a Whig and one of the most popular men in the state.

Presidential Candidate. Polk was the choice of Tennessee and several other states for the Democratic nomination for Vice-President in 1839. His failure to win this nomination and his defeats for governor in 1841 and 1843 do not seem to have lessened his influence in his party. Thus it happened that in 1844 it was again understood that he was a candidate for Vice-President. The national convention, unable to unite on Van Buren or any of the men, including Lewis Cass and James Buchanan, who opposed him, finally compromised on Polk for President. His platform was carefully stated by him in a letter to a committee which had supported him for Vice-President:

I am in favor of the immediate reannexation of Texas to the government and territory of the United States The proof is fair and satisfactory to my own mind that Texas once constituted a part of the territory of the United States, the title to which I regard to have been as indisputable as that to any portion of our territory.

The "reannexation" of Texas was coupled with the "reoccupation" of Oregon, and these made the principal issues of the campaign. The popular slogan was "Fifty-four forty or fight," in reference to the northern boundary of Oregon, but more votes were decided by Polk's clear-cut position in regard to Texas. The position of Henry Clay on the Texas question aroused the suspicion of many Northerners, and had it not been for the Whig votes in New York which went to James G. Birney, the anti-slavery candidate, Clay would probably have been elected. The contest was close and exciting; Clay received 105 electoral votes, Polk 175. Polk's majority of the popular vote of the nation was only 40,000.

The Administration of James K. Polk, 1845-1849

Polk selected a Cabinet which made a favorable impression on the country James Buchanan was Secretary of State, the others were Robert J. Walker, an ex-Senator and an authority on national finance, Secretary of the Treasury; William L. Marcy, ex-governor of New York, Secretary of War, George Bancroft, the historian, Secretary of the Navy; Cave Johnson, of Tennessee, Postmaster-General; John Y. Mason, who had been Secretary of War in Tyler's Cabinet, Attorney-General Bancroft resigned after a year, his place being taken by Mason, who was in turn succeeded by Nathan Clifford, of Maine. With this exception, the Cabinet remained unchanged throughout the four years, thus nearly equaling the record made by President Pierce's Cabinet

The War with Mexico. The outstanding feature of Polk's administration was the Mexican War. In his first annual message to Congress, the President declared that the annexation of Texas was a matter that concerned only the latter and the United States, no foreign country having any right to interfere. He also informed Congress that the American army under General Zachary Taylor had occupied the west bank of the Nueces River, beyond which Texas had never attempted to exercise jurisdiction. On December 29, 1845, Texas was admitted to the Union. The Mexican authorities, however, used every ingenuity to negotiate with the United States concerning the disputed territory east of the Rio Grande, but the negotiations came to naught. Thereupon, General Taylor's force advanced, and met the Mexican army at Palo Alto.

President Polk, after the Battle of Palo Alto, asked Congress to declare war. The declaration met considerable opposition from the Whigs, especially as it stated that a state of war existed "by the act of the republic of Mexico." Abraham Lincoln, then a member of the House of Representatives, introduced the so-called "spot resolutions," calling on the President to name the spot of American territory which had been outraged by the Mexicans, and might, therefore, be assigned as a reason for war. The justification for President Polk's order to the army to invade the disputed territory is perhaps doubtful and has sometimes been questioned by impartial historians. It must be remembered, however, that Polk himself believed the cession of Texas to Spain in 1819 was a mistake which should be rectified by reannexation. His party's platform demanded "reannexation," and the war became a mere detail in securing this end. Polk believed that the Mexican authorities could not

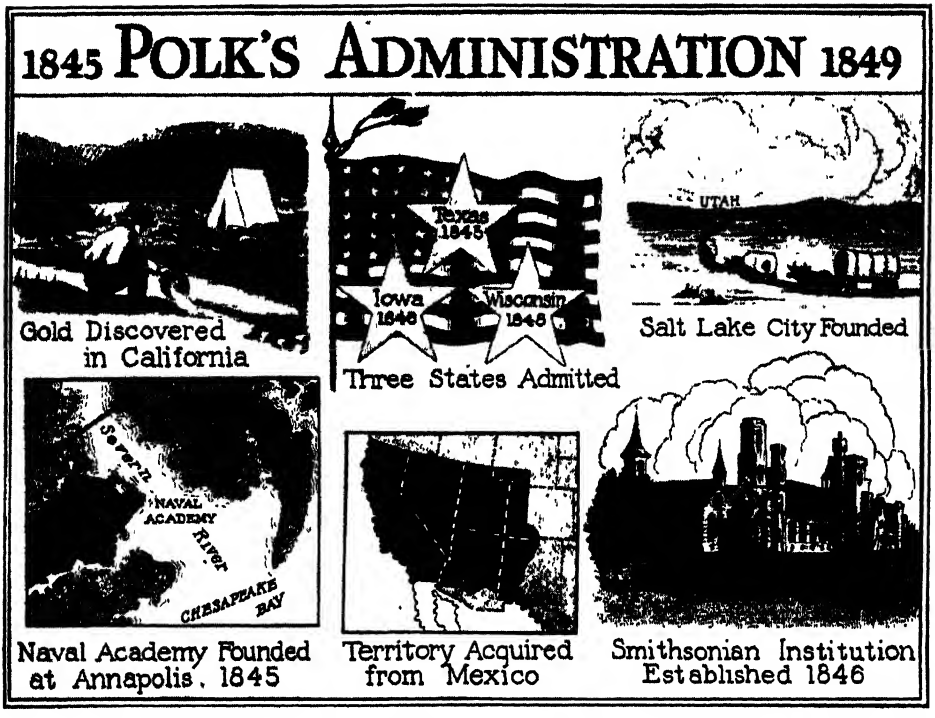


ELECTION MAP, 1844

States colored black gave their electoral votes to Polk (Democrat), states barred diagonally voted for Clay (Whig) Unshaded area north of Mexico and south of Canada represents unorganized territory.

be trusted, and that they could only be persuaded by force. However that may be, the war undoubtedly had the approval of the majority of the American people, particularly after the armies of Taylor and Scott had won a few victories.

The Wilmot Proviso. A political incident of the war period was the attempt to pass the Wilmot Proviso. Wilmot attempted to secure the prohibition of slavery in any territory which might be acquired from Mexico. The proviso passed the House, but failed in the Senate. The result of the contest over this principle soon resulted in the origin of the doctrine of "popular sovereignty," by which the Democrats attempted to reconcile the Northern and Southern members of the party. The principle of the Wilmot Proviso was finally adopted in 1862, when Congress forbade slavery



in "any of the territories of the United States now existing, or which may at any time hereafter be acquired."

The Oregon Question. While the United States was at war with Mexico, there was also great danger of war with Great Britain. The United States claimed that the line of 54° 40′ N. latitude was the northern boundary of the territory acquired from France and Spain, whereas Great Britain insisted that the Columbia River was the boundary. The Democratic platform demanded the whole of Oregon, up to 54° 40′, "with or without war with England," and "Fifty-four forty or fight" was the great rallying cry of the campaign. After many negotiations, however, the Senate, on June 15, 1846, accepted the compromise offered by Great Britain, to fix the boundary at the 49th parallel. As President Polk had endorsed the platform's demand for 54° 40′, he threw upon the Senate the entire responsibility for accepting the compromise treaty, but he realized without a doubt that compromise and not war was necessary.

President Polk's policy toward the Mexican problem and his open disapproval of the Abolitionists were often interpreted to mean that he was a pro-slavery man. On the contrary, he was not a slavery propagandist, and in the settlement of the Oregon question, he did everything in his power to secure the exclusion of slavery from that territory. In his message approving the bill to establish Oregon as a territory, Polk explained his attitude toward slavery in these words:

> I have an abiding confidence that the sober reflection and sound patriotism of all the states will bring them to the conclusion that the dictate of wisdom is to follow the example of those who have gone before us, and settle this dangerous question on the Missouri Compromise or some other equitable compromise which would respect the rights of all, and prove satisfactory to the different portions of the Union.

The Tariff of 1846. The tariff was another leading issue in the campaign of 1844. Polk was pledged to a tariff for revenue only. In accordance with his views, a bill was presented to Congress, and was passed after an unusually keen discussion, during which partisanship ran high. In the Senate the bill was saved from defeat by the vote of Vice-President Dallas, who broke a tie by voting for it. The unusual character of the discussion preceding the decision is indicated by his explanation of his vote, as follows:

> If by thus acting it be my misfortune to offend any portion of those who honored me with their suffrages, I have only to say to them, and to my whole country, that I prefer the deepest obscurity of private life, with an unwounded conscience, to the glare of official eminence spotted by a sense of moral delinquency.

President Polk, arguing more concretely, explained his views by saying that all classes—

OUTLINE AND QUESTIONS ON JAMES K. POLK

Outline

I. Early Years

(1) Birth and family
(2) Education
  (a) With private tutor
  (b) At University of North Carolina
  (c) Law study
(3) Career as a lawyer

II. Early Political Activity

(1) "Napoleon of the Stump"
(2) In state house of representatives
  (a) Opposition to dueling
(3) In Federal House
  (a) Work on committees
  (b) Elected Speaker
(4) As governor of Tennessee
(5) Candidate for Presidency
  (a) His platform
    1. "Reannexation" of Texas
    2 "Fifty-four forty or fight"
  (b) Outcome of election

III. Administration

(1) His Cabinet
(2) War with Mexico
  (a) Causes
  (b) Events
  (c) Outcome
(3) The Oregon trouble
  (a) United States claimed 54° 40′ as northern boundary
  (b) The compromise
  (c) Exclusion of slavery from territory
(4) Domestic affairs
  (a) Tariff of 1846
  (b) Wilmot Proviso
    1. Failure to pass Senate
    2 Growth of "popular sovereignty" idea
  (c) Internal improvements
    1. President's veto of bills
  (d) Reestablishment of independent treasury
  (e) Formation of Free-Soil Party
  (f) Admission of states
  (g) Organization of territories
  (h) Discoveries and inventions
    1. Ether
    2. Sewing machine
    3 Cylinder printing press
  (i) Founding of United States Naval Academy
  (j) Founding of Smithsonian Institution
  (k) Election of 1848

Questions

When was "Fifty-four forty or fight" a popular slogan, and what did it mean? How did the United States finally compromise on its attitude toward this question, and what was the President's view of the compromise?

Who said, "I prefer the deepest obscurity of private life, with an unwounded conscience, to the glare of official eminence spotted by a sense of moral delinquency," and under what circumstances did he say it?

What two questions made Polk's administration one of the most important in the history of the country?

Of what state was Polk a native? Was any other President born in the same state?

When was Polk called the "Napoleon of the Stump," and what do you understand by the nickname?

What was his attitude toward the Abolitionists? Toward slavery?

How did Polk justify his use of the word "reannexation," rather than "annexation," in speaking of Texas?

What were the "spot resolutions," and by whom were they introduced?

Why did Polk persistently veto bills for various internal improvements?

What was the doctrine of "popular sovereignty," and how did it grow out of the Wilmot Proviso?

How did Polk compare with previous Presidents in the matured opinion of Bancroft, the historian, who served in his Cabinet?

the farmer, the manufacturer, the man of commerce, the navigator, and the mechanic—"are equally entitled to the nation's protection."

Internal Improvements. On the tariff, the President's views coincided with those of the majority in Congress, but on the question of internal improvements, they differed. A large majority in both houses favored a liberal use of the nation's funds for such improvements. In vetoing a rivers-and-harbors bill, in 1846, Polk submitted a message of unusual interest, in which he called attention to the harmfulness of a system which allowed the nation's money to be spent in particular sections, leaving other parts of the country without financial assistance from the government. In 1847 Congress again voted large sums for internal improvements, but Polk again vetoed the bill.

Reëstablishment of the Independent Treasury. Worthy of special mention is the Act of August 6, 1846, reëstablishing the independent treasury system. In principle, under this act, the government "pays cash, demands cash, and keeps its funds in a strong box," but in actual practice there have been wide variations from principle. The purpose of the act was to free the treasury from interference by the banks.

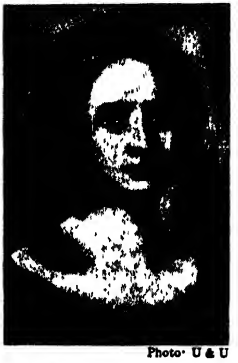
Other Noteworthy Events. One of the results which followed the introduction of the Wilmot Proviso was the development of the doctrine of popular sovereignty. Offsetting this movement was the formation of the Free-Soil Party. Three states were admitted to the Union during Polk's administration; these were Texas in 1845, Iowa in 1846, and Wisconsin in 1848. Oregon was organized as a territory in 1848, and in 1849 California, though not then admitted to the Union, organized its own government. Gold had been discovered in California in the preceding year, and the quest for the precious metal drew thousands to the newly opened regions. The year 1849 also saw the founding of Salt Lake City by the Mormons. In 1846 Elias Howe received his patent on the sewing machine, which he had perfected in the preceding year, and in 1847 the Hoe cylinder printing press was invented. Ether was first used as an anesthetic in surgery in 1846. During Polk's term were founded two institutions, now of national importance—the United States Naval Academy at Annapolis, in 1845, and the Smithsonian Institution at Washington, in 1846. The year 1846 was also memorable for the terrible famine in Ireland, as a result of which the first great Irish immigration to the United States began.

Election of 1848. In accepting the nomination for President in 1844, Polk declared that he would discharge the duties of the office "with the settled purpose of not being a candidate for reëlection." To this purpose he adhered. The Democrats then nominated Lewis Cass of Michigan. The Whigs chose General Zachary Taylor, and the newly organized Free-Soilers nominated Martin Van Buren. Taylor was elected.

At the close of his term, Polk retired to Nashville. There he died, on June 15, 1849. In his will, he left his estate "to the worthiest of the name forever," but the courts in 1891 decided that it was void because it directed a perpetuity. Mrs. Polk (Sarah Childress, 1803-1891), lived on the estate until her death. The remains of the President and his wife were interred within sight of the old homestead, but were removed by the state of Tennessee in 1893 and reinterred on September 19, on Capitol Hill, Nashville. The homestead was long ago torn down, and a part of the site is occupied by the Carnegie Public Library. E.D.F.

Sarah Childress Polk (1803-1891), daughter of Captain Joel Childress of Murfreesboro, Tenn., and a handsome woman of Spanish features and coloring, married the young Tennessee legislator, James K Polk, when she was nineteen years old.

Mrs Polk's calm dignity was her most marked characteristic. Her serenity calmed even the fierceness of the 1840 campaign between Clay and Polk Her simple upbringing, her strict training in a Moravian Institute school in North Carolina, and her devoted religious faith had immediate effects upon her part of Washington society She abolished dancing in the White House, and declined to enter into the gay social life of the city



Photo· U & U

SARAH CHILDRESS POLK

However, in spite of this "cold respectability" and formal correctness at the White House, which oppressed official Washington, Mrs. Polk was universally admired and respected, for she was also affable and sincere. After their retirement to Nashville, and following the ex-President's death, Mrs. Polk continued to reside at "Polk Place," receiving visitors—it was the custom of the Tennessee legislature in a body to call on her on New Year's Day—and other marks of respect. Mr. and Mrs. Polk had no children, but after her husband's death, Mrs. Polk adopted a niece.

Related Subjects. The reader who desires additional information respecting events in the life and times of this President is referred in these volumes to the following articles:

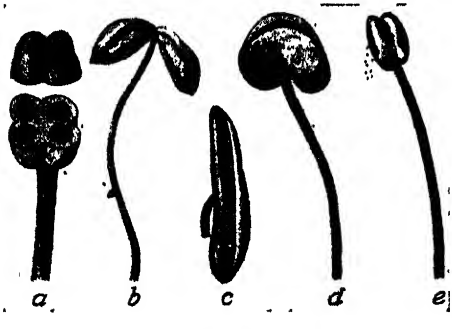
Duel	Taylor, Zachary
Mexican War	Texas (History)
Oregon (History)	Treasury Department
Political Parties	Wilmot Proviso

POLK, LEONIDAS (1806-1864), an American soldier, bishop of the Protestant Episcopal Church, and Confederate general during the War of Secession. He was born in Raleigh, N. C., and was educated at West Point, where

he was graduated in 1827. He resigned from the army, entered the ministry, and became the first Protestant Episcopal bishop of Louisiana. While thus serving, he was instrumental in establishing Sewanee (Tenn.) University (now the University of the South), in 1858. After the outbreak of the War of Secession, Bishop Polk tendered his services to the Confederate government and was appointed major general by Jefferson Davis, with command of the defense of Missouri and Tennessee. Later, as lieutenant general, he fought at Stone River, Belmont, Shiloh, Perryville, and Murfreesboro, and led a corps at Chickamauga. He was temporarily suspended for disobedience to orders in this last battle, but was exonerated by President Davis. During the early part of 1864, he had charge of the Department of the Mississippi and was with Johnston in the Atlanta campaign. He was killed by a cannon shot on the Marietta (Ga.) battlefield.

POLKA. See DANCING (Modern Dances).

POLLEN, *pol' en*, AND POLLINATION, *pol ih na' shun*. The tiny golden grains of pollen formed in the anther of a flower, when carried to the stigma, or seed-bearing part of a similar flower, by insects, wind, or other agencies, germinate and grow down to the ovules. There fertilization of the egg cells results, with the subsequent growth and division of the egg cell to form the embryo, around which the other structures of the seed are differentiated. The pollen grains are minute structures of various forms, smooth or covered with spines or knobs, but always the same in the same plant. Under the microscope, a

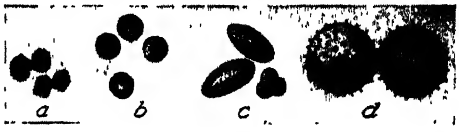


POLLINATION

(*a*) Stamen of moonseed, with anther cut across; (*b*) stamen showing two anther cells diverging, (*c*) stamen of globe amaranth, open from top to bottom, showing pollen; (*d*) stamen of mallow; (*e*) stamen showing split down between the two cells and means by which pollen escapes

grain appears ordinarily as a single cell, but in reality it is more complicated, and the history of the development of pollen as a phase in the life of the plant is remarkably interesting to the botanical student.

Pollination is merely the transfer of the pollen to the stigma. *Self-pollinated* flowers are those in which this transfer is made without the assistance of outside agencies, while *cross-pollinated* flowers are those which must depend



TYPES OF POLLEN GRAINS

(*a*) Dandelion; (*b*) hemp; (*c*) gentian; (*d*) squash.

upon other agents to carry the pollen of one flower to the stigma of another. Usually inconspicuous and odorless flowers, and those whose stigmas, before withering, curve so as to come into contact with the anthers, are self-pollinated.

Insects as Pollen-Carriers. When flowers are not adjusted for self-pollination, they are equipped with various aids effective in cross-pollination. In some, the showy blossom, in others, the fragrant scent, in still others, the sweet nectar, attract insects to the flower.

The most important carriers of pollen are the honeybees, which flit from flower to flower to sip the nectar, which they convert into honey. As they wallow in the pollen, they rub the grains on their hairy bodies. They are provided with two tiny cups on the hind legs for the carrying of pollen to their nests, but that which is scattered over their bodies is shaken off on the flowers they afterward visit. Usually, the flowers whose color attracts bees are red, blue, or pink; in yellow and white blossoms, it is the nectar that attracts the insects. The importance of these insects to plant life is shown by the fact that, when some vegetables are grown under glass, it is necessary to keep a swarm of bees in the hothouse to assure pollination of the flowers, and consequently another crop.

Ants, beetles, moths, and butterflies are other pollen-carriers. Some flowers are adapted to pollination by certain insects. Those which give off their fragrance at night, such as some varieties of honeysuckles and petunias, are pollinated by night moths, and those which are most fragrant in the sunlight attract day-flying bees and butterflies. Other flowers, such as the violet, in which the nectar is deeply hidden in the corolla, cannot be pollinated by small insects, although the pollen grains can easily be reached by the tongues of bees. In the snapdragon, the little trapdoor concealing the pollen can be pushed open only by large insects.

An interesting example of the dependence of a flower upon one particular kind of insect is seen in the fig, which cannot produce seed that will grow unless pollinated by a small wasp.

The bloom of the yucca tree is self-pollinated only by the yucca moth, which lives in the flower.

Wind and Other Agents. The wind scatters the light, dry pollen of many flowers and weeds, and the humming bird carries that of the wild balsam, trumpet creeper, gladiolus, and similar flowers. B.M.D.

Related Subjects. The reader is referred in these volumes to the following articles.

Bee (Honeybee)	Flowers (Flower Structure)
Burbank, Luther	Germination
Cross-Pollination	Seeds (Seed Dispersal)
Fig	

POLL, *pohl*, TAX, a term derived from the English *poll*, which means *head*; it is sometimes called *capitation* tax, from a Latin word meaning *head*. A poll tax is therefore a uniform tax levied upon male citizens without reference to their property, income, business, or employment.

The United States Congress has never exercised its right to levy a national poll tax, but many states of the Union provide this as a means of raising revenue, and in some of them the right to vote depends on the payment of a poll tax. On the other hand, it is within the province of a state to declare against the poll tax, and a few have done so, on the ground that it is harsh and oppressive. It is an unpopular tax, since the people naturally feel that government revenue should be levied on property. Wherever levied, the money derived is placed with the general revenues of the taxing body. A poll tax seldom exceeds $2 in amount.

In England a poll tax has been imposed several times, the last being in 1698. Three hundred years earlier, such a levy was the occasion of Wat Tyler's Rebellion (which see). See TAX AND TAXES.

POLLUX, *pol' uks*. See ASTRONOMY (The Stars and Their Names).

POLO, *po' lo*, a ball game played on a grass-covered field by men on horseback. In its rules it is very much like hockey (which see). Two opposing teams, usually of four men each, endeavor to drive the ball through their opponents' goal posts. A regulation field is 900 feet long and 450 feet wide; the posts, which are made of light wood or papier-mâché, so that they will break easily in case of collision, are placed twenty-four feet apart, at opposite ends of the field. The players use white wooden balls three and one-fourth inches in diameter, and cane or rattan mallets from fifty to fifty-six inches in length. At one end of the mallet is a cigar-shaped piece of hard wood; a lightweight leather strap at the other end is fastened about the wrist.

In starting the game, the men of each team are stationed so as to defend their respective goals, the first two men playing forward, the third half back, and the fourth full back. The game is divided into eight periods of seven and one-half minutes each, called *chukkers*, from a Hindustani word, three-minute intervals between periods being allowed for changing ponies. At the end of the fourth period, a rest of seven minutes is allowed. As polo is a fast and exciting game, the ponies are driven very hard, and can play but a short time without resting. The expense of training and keeping these animals makes the game, as a rule, a rich man's pastime, but it is a favorite game of cavalry officers.

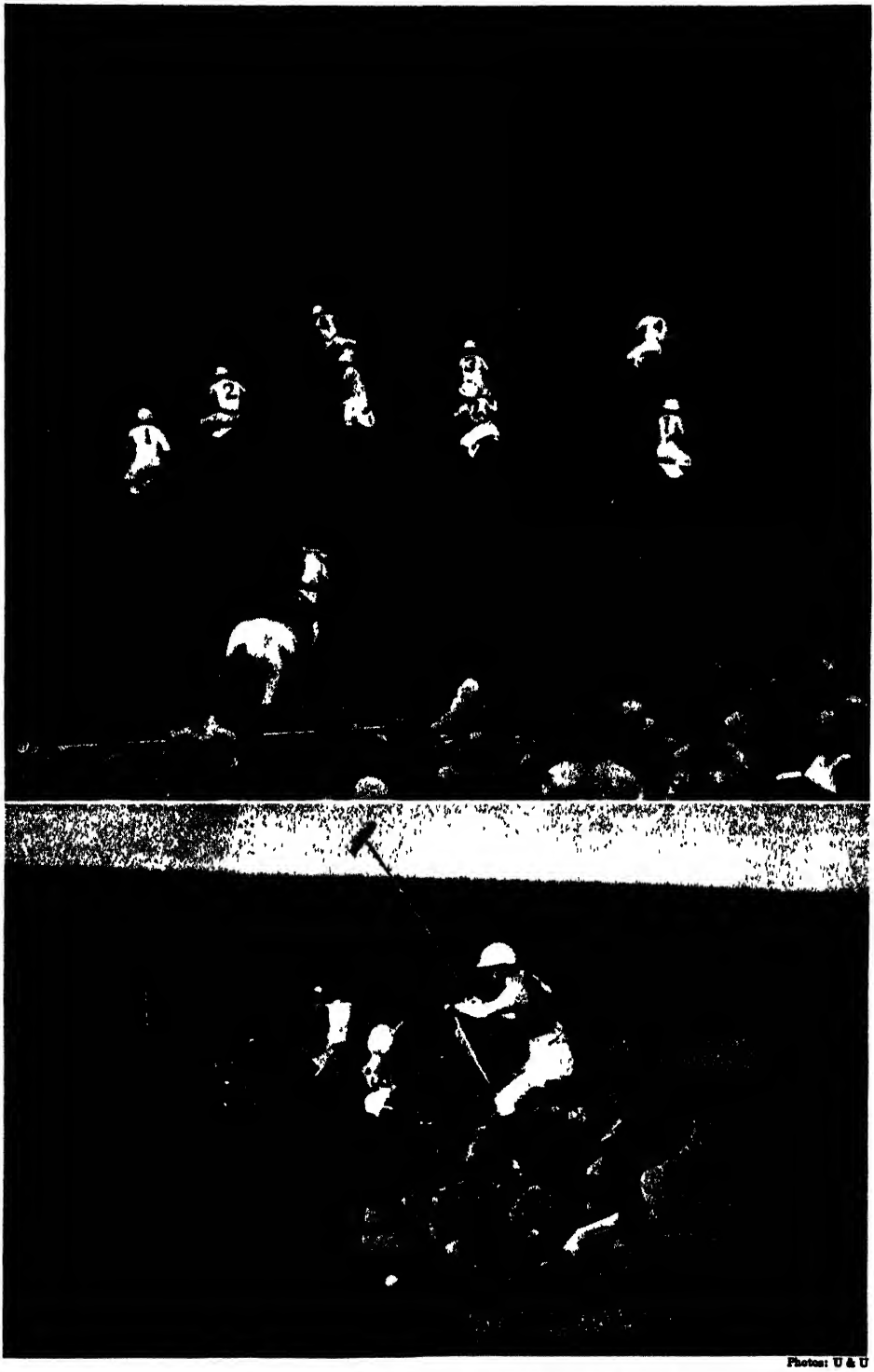
It is thought that polo originated in Persia at least 2,000 years ago, and spread throughout the Eastern countries and Europe. In England and its colonies it has long been a high favorite among sports, and since 1876, when James Gordon Bennett introduced it into the United States, it has been steadily growing in favor with Americans. The international championship has been won a number of times by American teams.

Water Polo is a similar game played by swimmers, who use an air-filled ball that will float in water.

POLO, MARCO (about 1250-1324), a medieval traveler who lived in Venice, and whose journeys in the East made him famous. He was the son of Nicolo and the nephew of Maffeo Polo, whose trade ventures led them into long journeys in the Orient. On one of these journeys they reached Cathay (China) and were cordially received at the court of the celebrated Kublai Khan. Returning to Venice in 1269, they set out again for Cathay two years later, and this time took the young Marco with them. The Mongol ruler received them with even greater marks of favor, and appointed Marco to various offices of importance, which made it possible for him to become acquainted with different parts of the realm. Indeed, so greatly did Kublai appreciate the society of the Europeans that he was loath to allow them to depart, and only with great reluctance gave his consent to their accompanying an embassy to Persia, which set out in 1292.

In 1295 the Polos reached Venice again, and in the next year, Marco took part in a war between his native city and Genoa, in the course of which he was taken prisoner. During his confinement, he dictated in French to a fellow prisoner the story of his travels, which was published as the *Book of Marco Polo*. This created a wide sensation, and for centuries was the source of European knowledge about the Orient. Most of its statements were looked upon as fiction or exaggeration, but later explorations showed Marco Polo to have possessed keenness of observation and an accurate memory.

The historian John Fiske said of Marco Polo's book that it was one of the most famous



Photos: U & U

A Game for Men of Leisure. Above is a view of a polo match between teams representing the United States and Argentina. Below, a tense moment in a game in Illinois.

and important books of the Middle Ages. In Fiske's opinion, it contributed more new facts toward a knowledge of the earth's surface than any book that had ever been written before.

POLONAISE, *po lo naze'*, a national folk dance of Poland. See DANCING.

POLONIUM, *po lo' nih um.* See CHEMISTRY (The Elements).

POLYANDRY, *pol ih an' drie.* See POLYGAMY.

POLYBIUS, *po lib' ih us* (about 204-122 B.C.), an eminent Greek historian. While still a young man, he held important political positions in his native city of Megalopolis, in Arcadia, but after the conquest of Macedonia, in 168 B.C., he was taken with other noble young men to Rome as a hostage. There he became intimately acquainted with Scipio Africanus the Younger, and accompanied him on his expeditions to Spain and Africa. Later, he rendered valuable service to his native country by helping to procure favorable terms in a treaty between Rome and Greece. He is, however, chiefly noted for his *Histories*; of his forty books, but five have come down to us. The history as a whole treated of the growth of the Roman Empire from 266 to 146 B.C. Polybius was the first historian to try to trace the causes of events.

POLYBUS, *pol' ih bus.* See OEDIPUS.

POLYCARP (about 69–about 155), bishop of Smyrna, and a celebrated Christian martyr. As a child he was taught by the Apostles, notably John, and lived in familiar intercourse with many who had seen Christ. This early contact with John, and his later friendship with the youth Irenaeus, who became bishop of Lyons and one of the leading Church fathers of the West, makes Polycarp the living link between the Apostolic Age and that of the nascent Catholicism. This period, before the faith of the Church had crystallized in its earliest creed, was the most perilous in its history, and Polycarp's struggle against the revival of paganism, and his faithful transmission of the Apostolic tradition, were largely responsible for the preservation of the Christian ideal.

The little we know of him comes from the writings of Irenaeus and Eusebius, and the anonymous *Martyrdom of Polycarp*. The only extant work of his own is the *Epistle to the Philippians*. When he was about eighty-six years old, the Roman government at Smyrna condemned him to death by burning. When offered his life if he would revile Christ, he replied, "Four-score and six years have I been His servant, and He hath done me no wrong. How then can I blaspheme my King who hath saved me?"

POLYCOTYLEDON, *pol ih kot e le' dun.* See SEEDS; COTYLEDON.

POLYCRATES, *po lik' ra teez*, a tyrant of Samos, who lived in the sixth century B.C. He made himself ruler of Samos in 535 B.C., compelled other islands to pay tribute to him, and conquered some of the provinces of Asia Minor. For a time his good fortune was so uninterrupted that he was called "the darling of the gods," but his exceeding prosperity helped to bring about his downfall. Herodotus tells that the Egyptian king Amasis, a strong ally of Polycrates, became alarmed lest the gods, in jealousy, should turn against the Samian despot; and he implored Polycrates to sacrifice to them some possession which he valued highly. Accordingly, Polycrates threw into the sea a ring of great worth, which the next day was found in the belly of a fish that had been presented to him. Looking upon this as a sign that the gods would not accept the sacrifice, Amasis broke the alliance. About 522 B.C., a Persian ruler of Sardis invited Polycrates to visit him, and on his arrival had him put to death.

POLYCYTHEMIA, *pol ih si the' mih ah.* See BLOOD (Diseases).

POLYGAMY, *po lig' ah mie*, a system of marriage by which a man has more than one wife at one time. The word, commonly used in this sense, is from two Greek words meaning *many marriages*, and in its widest sense includes *polyandry* also, which is the term descriptive of one wife for many husbands; but polygamy in its more accurate sense denotes a plurality of wives. From earliest times to the present, the taking of more than one wife has been common among various races, though never in the world's history has it been the only form of the marriage relation. It was not forbidden among the ancient Greeks, but was seldom practiced, and it gained almost no hold among the Romans. The Britons practiced it, but it was very rare among the early Germans, a fact which the Roman historian Tacitus found worthy of note.

In Oriental countries, polygamy is often permitted, and sometimes enjoined, by the religion of the state. Mohammedans may have four wives, but among them, as among other peoples who approve of polygamy, the custom really obtains only among the wealthy classes, for the poor man cannot support more than one wife, even in the primitive style in which he lives. Among the Hindus there are no restrictions as to number, and a harem of one hundred wives was by no means unknown, but the practice is not now common. Chinese law permits of but one wife. In Turkey, polygamy was abolished by the new laws enacted in 1925 by the National Assembly, which enforced the registration of marriages, and empowered the President (Kemal Pasha) to grant divorces.

The ancient Jewish law permitted polygamy as well as concubinage, and the Bible contains no injunction against it. Christianity, however, has always strongly opposed it, and laws

against it exist in all Christian countries. In the United States, the Mormons, enjoined thereto by their religion, practiced polygamy openly until 1890, when Congress passed laws forbidding plural marriages. See MORMONS (Doctrines of the Church); ARTHUR, CHESTER A. (Administration).

POLYGNOTUS, *pol ig no' tus* (about 450 B.C.). See CHARON.

POLYGON. If three or more points in a plane, no three of which are in a straight line, are joined in order by straight lines, the resulting figure is called a *polygon*. The lines are called the *sides*; the sum of the sides is the *perimeter*. The angles formed by the sides are the *angles* of the polygon, and the meeting points of the sides are the *vertices* of the polygon. A polygon is a triangle, quadrilateral, pentagon, hexagon, heptagon, octagon, etc., according as the sides number three, four, five, six, seven, eight, etc. If all the sides are equal, the polygon is *equilateral*. If all the interior angles are equal, the polygon is *equiangular*.

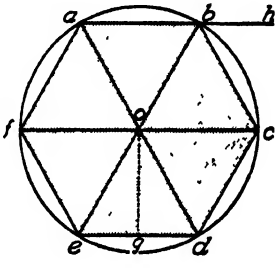


FIG 1

The angles inside the perimeter are called the *interior* angles. If the sides are extended, they form other angles lying outside the polygon, which are called the *exterior* angles.

In Fig. 1 the angle *a b c* is an interior angle; the angle *h b c* is an exterior angle.

The sum of the interior angles of a triangle is 180°, or two right angles. The sum of the interior angles of a quadrilateral is 360°, or four right angles. *The sum of the interior angles of any polygon is the number of sides minus 2, times two right angles.* This can be seen by dividing any polygon into triangles, as in Fig. 1. There are as many triangles as sides of the polygon; the sum of the angles of each triangle is two right angles. The sum of the angles at the center is four right angles. So the sum of the interior angles of the polygon equals six times two right angles, minus the four right angles at the center, or sum of interior angles: this may be stated: 6×2 right angles -2×2 right angles, or $(6-2)\times2$ right angles.

Let n stand for the number of sides of any polygon and s for the sum of its interior angles, and we have:

$$s=(n-2)\times2 \text{ rt. angles}$$

or

$$s=(n-2)\times180^\circ$$

The sum of the exterior angles of a polygon, taking one at each vertex, is four right angles, or 360°.

It is seen in Fig. 1 that the sum of the exterior angle at *b* and the interior angle at *b* is 180°. Then the sum of the exterior and interior angles at all the vertices is n, the number of vertices, times 180°. But we know that the interior angles equal $(n-2)\times180^\circ$, and we see that the sum of the exterior angles equals $n\times180^\circ-(n-2)\times180^\circ$, or $(n-n+2)\times180^\circ$, or $2\times180^\circ$, or 360°, or four right angles.

A regular polygon is one that is both equilateral and equiangular. A regular polygon may be divided into equal triangles. The area of each triangle is the product of its base and half its altitude. In Fig. 1, the area of triangle *e o d* equals $\frac{e\,d\times o\,g}{2}$.

The area of the polygon is equal to the number of sides times the area of each triangle. Let n be number of sides of a regular polygon, l equal length of each side, and a be the perpendicular distance from the center to each base; then area of polygon $=n\times l\times\frac{a}{2}$, or area of polygon $=$ perimeter $\times\frac{a}{2}$.

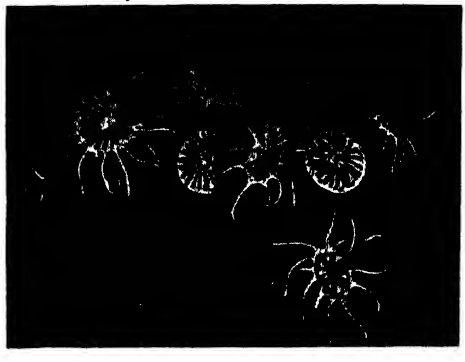
J.W.Y.

POLYHYMNIA, *pol ih him' nih ah*, one of the Muses (which see).

POLYNESIA, *pol ih ne' shih ah.* See PACIFIC ISLANDS.

POLYNICES, *pol ih ni' seez*, the brother of Antigone (which see). See, also, OEDIPUS.

POLYP, *pol' ip*, a name applied to a certain type of marine invertebrate. The characteristic polyp structure is that of a hollow cylindrical body attached at one end to stones or other objects on the bottoms of streams or in the sea. The free end of the body has a mouth opening with a circle of tentacles which reach out to gather food, while small cells within the body digest it. The fresh-water hydra and sea anemone are examples of simple polyps; the


POLYPS

coral is a compound form. A frequent method of reproducing is budding, a process involving the separation of a new growth from the parent organism. Polyps also reproduce by means of eggs. S.H.S.

Related Subjects. The reader is referred in these volumes to the following articles:

Coelenterata	Hydra, Fresh-Water
Coral	Sea Anemone

POLYPHEMUS, *pol ih fe' mus*, in the Greek myth, a son of Neptune; a Cyclops, who lived with the other Cyclopes on the island of Sicily. All day he wandered about with his flocks, which at night he drove into a huge cave where he lived alone. Ulysses and his companions were cast ashore on the island during their voyaging; at once they were captured by the giant and shut up in his cave to be devoured. Four were eaten, and then Ulysses with his remaining comrades, having made the giant drunk, blinded him by plunging a heated stick into his one great eye. Roaring with pain, Polyphemus called the other Cyclopes, who asked who was making him suffer. "Noman is hurting me," cried Polyphemus. Now the Cyclopes could not know that Noman was the name by which Ulysses had called himself, so they refused their help, declaring that the pain must be from the gods, in punishment for sin. Mad with rage and pain, Polyphemus stationed himself at the entrance of the cave that no one might escape, but Ulysses and his companions, by tying sheep together in threes and concealing themselves beneath them, passed out in safety.

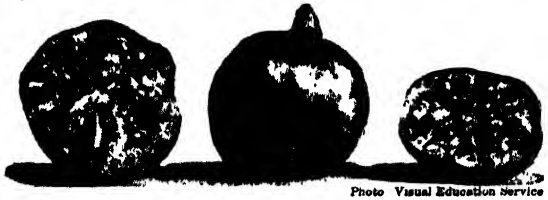


Photo Visual Education Service

POMEGRANATE
Showing, also, cross section.

Related Subjects. The reader is referred in these volumes to the following articles

Cyclopes	Odyssey (The Story)
Galatea	Ulysses

POLYTECHNIC INSTITUTE OF BROOKLYN. See NEW YORK (Education).

POLYTECHNIC, *pol ih tek' nik*, SCHOOLS. See SCHOOL (Technical Schools); MANUAL TRAINING.

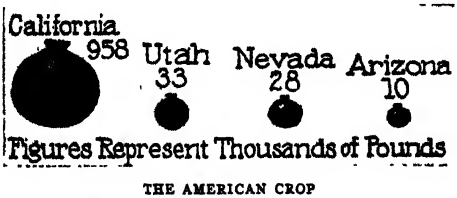
POLYTHEISM, *pol' ih the i'zm*, a Greek word meaning *belonging to many gods*, is the distribution of a faith and worship among several gods, as opposed to *monotheism*, which is the belief in and worship of one God. The general supposition is that monotheism is the original form of worship, and that polytheism and other forms of belief sprang from those who abandoned the first principles. The feeling of dependence and the inclination to worship are natural to man; hence people living under primitive conditions are easily induced to worship familiar objects or forces that inspire admiration or awe. The primitive man's conception of nature held that all things, animate and inanimate, possessed sensibilities and passions like his own, with the power to help or hurt him; consequently he would fear, flatter, or venerate them.

At first polytheism consisted in the worship of the elements, of the stars, and of fire. Later it took special form from the traditions and relative civilization of each nationality. Among the savages it sank to fetishism (see FETISH). The sea, the sun, the moon, rivers, plants, and stones were worshiped, and it is but a step from the lowest fetishism of the savage to the polytheism of the more cultured people of antiquity, in which the same objects became their gods; for example, Jupiter, Neptune, and Apollo. In the early days of polytheism, the gods were frequently interchanged, and when the believer vainly sought aid from one, he might turn to another for protection. Accordingly, in some countries the gods were classified in many and various groups to satisfy all the numerous necessities and castes.

POLYZOA, *pol ih zo' ah*. See ZOOLOGY (Divisions of the Animal World).

POMATO. See BURBANK, LUTHER.

POMEGRANATE, *pom gran' ate*, the fruit of a tree widely cultivated in the tropics and subtropical regions, and found wild in Western Asia and Northwestern India. As the pomegranate is sensitive to low temperatures, it is grown commercially in the United States only in the southern part of the country. Though bushlike when wild, under cultivation the plant is trained to grow as a tree. It reaches a height of fifteen to twenty-five feet and bears numerous slender branches, at the ends of which appear the large, scarlet flowers. The fruit, which has a hard rind and looks something like an orange, is of a deep golden-red color. It is filled with numerous seeds, each enclosed in a layer of crimson pulp having a pleasant, refreshing taste.



THE AMERICAN CROP
The figures represent the average number of pounds yearly for a period of four years.

As a fruit the pomegranate is little used. The pulp is used to make cooling drinks; in Mexico an ardent spirit is distilled from it; and in Persia it is made into wine. The rind contains a large amount of tannin, which is employed as an astringent medicine and is valued in the tanning of leather. The pomegranate was familiar to the Hebrews in Bible times; a picture of the fruit appeared on the pillars of Solomon's Temple. In classic mythology, Proserpina (which see) was forced to spend six months of each year in Hades because she had eaten six seeds of the pomegranate while living with Pluto. B.M.D.

Classification. The botanical name of the pomegranate is *Punica granatum*.

POMELO, *pom' eh lo*, the horticultural name of the grapefruit (which see).

POMERANIA, a Prussian province in the northern part of Germany, lying along the Baltic Sea. It has an area of 11,663 square



LOCATION OF POMERANIA

miles and a population (1925) of 1,877,324. The chief river is the Oder, on the banks of which is situated the city of Stettin, the capital and commercial center of the province [see GERMANY (Principal Cities)].

There are numerous harbors along the Baltic, and many lakes are found in this region. Pomerania is for the most part a flat farming country, which produces good crops of rye, oats, wheat, barley, potatoes, beets, and tobacco. The smoked fish of the province is famous. Shipbuilding, glass-making, sugar-refining, brewing, distilling, and the manufacture of tobacco products, woolen goods, and machinery are the chief industries of the towns. Politically the province is divided into three districts—Stettin, Köslin, and Stralsund.

Pomerania was occupied by the Vandals originally, but in the fifth and sixth century, the Slavic Wends came, remaining until 1637. By the Treaty of Westphalia, in 1648, Brandenburg gained the greater part of Farther Pomerania, and the remainder went to Sweden. In 1720 Prussia was given part of Swedish Pomerania, and in 1815 the remainder.

POMERANIAN. See SPITZ.

POMOLOGY, *po mol' o jie.* See HORTICULTURE.

POMONA, *po mo' na*, the Roman goddess of fruit and flowers. Of several myths associated with her name, the most interesting is the story of the courtship of Vertumnus. When she had long refused to listen to his pleadings, he disguised himself as an old woman, came into her garden, and began to converse with her about love. Pomona finally admitted that only one of her suitors, Vertumnus, was worthy of her. Upon hearing this confession, her lover revealed himself in his true form and clasped her in his arms. She then consented to marry him.

POMONA, CALIF. See CALIFORNIA (back of map).

POMONA COLLEGE. See CALIFORNIA (Education).

POMPADOUR, *pawN pa door'*, JEANNE ANTOINETTE POISSON, Marquise de (1721-1764), a mistress of Louis XV of France. Like most of the royal favorites who were elevated to temporary prominence, she was of lowly birth; but she had received an excellent education, and had been introduced to good society in the home of a wealthy financier. In 1741 she married Le Normant d'Etioles, and five years later, after the monarch had met her at a masked ball, went to live in Versailles as the king's mistress. She was given the title of Marquise de Pompadour.



Photo Brown Bros

MADAME DE POMPADOUR

She was hardly established firmly in the king's favor before she showed an ambition to mix in politics. As an illustration of her power, it is recorded that in the Seven Years' War (which see), France became allied with its traditional enemy, Austria, because Maria Theresa had written a pleasing letter to the marquise, soliciting her favor. Her influence over the king, which was very great, she kept after his love for her had cooled, for she proved herself ready and able to provide him with entertainments and the riotous dissipation which he craved. Ministers depended on her favor, and important diplomatic points were decided by her. See LOUIS (XV, France).

POMPANO, *pom' pah no*, the common name of a genus of valuable food fish belonging to the

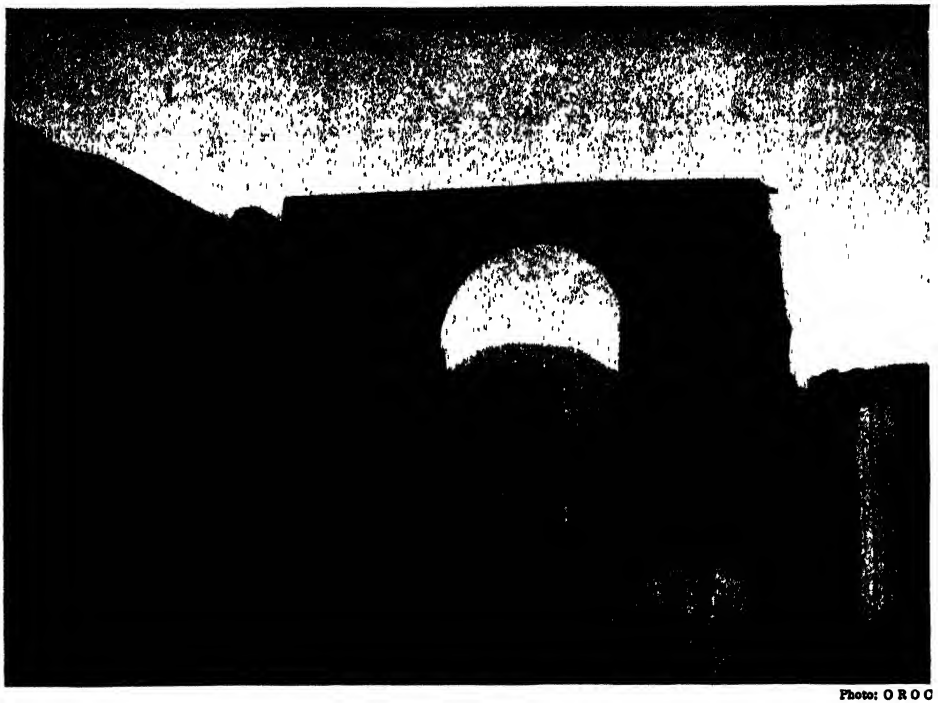
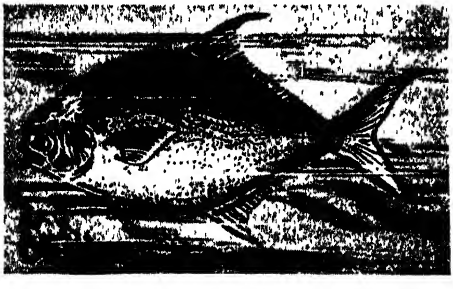


Photo: O R O C

DEMOCRACY RULED IN POMPEII

The illustration shows the entrance to the court of justice. In the floor three stones were set, to force the haughty aristocrats who approached in their chariots to dismount and enter the court on foot, as did the humblest citizen.

horse-mackerel family, about a dozen species of which are found in the salt waters of America. The *common pompano* inhabits the waters along the Gulf and South Atlantic coasts of the United States, and is found in the vicinity of the Florida Keys the year round, especially in the tidal inlet of Florida known as Indian River. This fish is a foot and a half long, has an aver-



THE POMPANO

age weight of seven or eight pounds, and is bluish above and silvery or slightly golden below, with yellowish breast. The body is oblong and flattened. The flesh of this pompano is highly prized for its rich and delicate flavor, and large numbers are caught in nets, especially on the Florida coasts. It is not a fish for anglers, for, according to one authority, "it never takes a hook except by mistake."

Other species are the *round pompano*, which is found as far north as Cape Cod; and the *great pompano*, largest of the group, which attains a length of three feet, and inhabits the seas from the West Indies north to Florida. L.H.

Scientific Names. The common pompano is *Trachinotus carolinus*; the round and great, or black-finned, pompanos are, respectively, *T. falcatus* and *T. goodei*.

POMPEII, *pom pa' ye*, an ancient city of Italy which disappeared following the tragic eruption of Mount Vesuvius in A.D. 79. Its restoration, after its burial for almost two thousand years under a blanket of cinders, pumice stone, and ashes, is bringing to light much of value to history and archaeology. Each year excavations yield additional bits of ancient art and architecture, and disclose secrets of the private and social life of a romantic period in the story of Rome of olden days.

There was nothing very remarkable about Pompeii, yet it has become more widely known than many of the more prosperous and

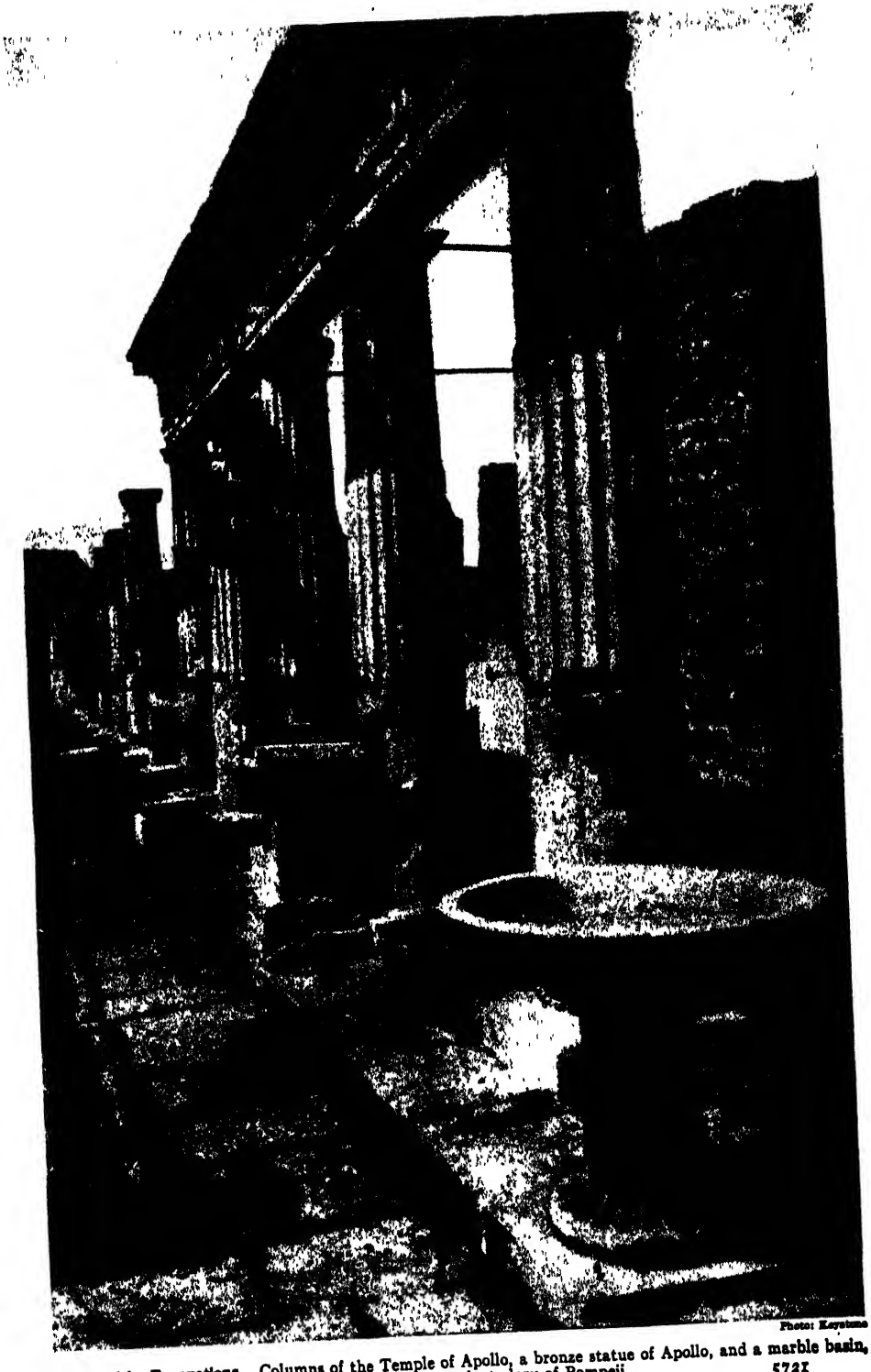


Photo: Keystone

Revealed by Excavations. Columns of the Temple of Apollo, a bronze statue of Apollo, and a marble basin, all testifying to the ancient glory of Pompeii. 5727

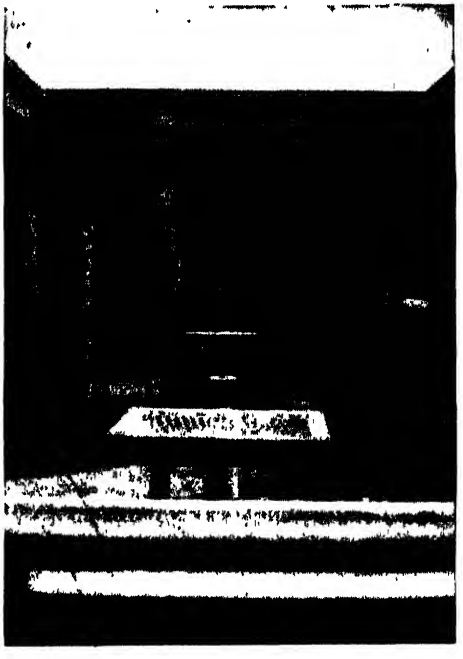
wealthy Roman towns. It lay on a plateau of ancient lava at the mouth of the Sarnus River near the Bay of Naples, less than a mile from the foot of Mount Vesuvius. Founded in the sixth century B.C., the city had become a Roman colony 159 years before the tragedy which ended not only its existence, but that of the two near-by cities, Stabiae and Herculaneum.

Pompeii was built in the form of an oval about two miles in circumference, and was surrounded by a wall pierced by eight gates. The streets, which regularly crossed at right angles, were paved with blocks of basaltic lava, in which may be seen the ruts made by the wheels that passed over those thoroughfares so many centuries ago. In the center of the city was the open square, or forum, typical of Roman cities, and surrounded by a group of important buildings. There were also a few theaters, a gladiators' court, numerous temples, and several large and sumptuously equipped public baths, such as the Romans delighted in. Lured by its blue skies, a number of prominent Romans had built their villas near the Mediterranean shore, and the city enjoyed a prosperous trade in wine, oil, and breadstuffs.

Mount Vesuvius had given warning in A.D. 63, but Pompeiians regarded its grass-grown crater as extinct. No one dreamed that under its green slopes there lay a smoldering fire. The lava of ancient days had made its vineyards possible, and supplied the stone for pavements and buildings. And so the gay life of Pompeii continued unrestrained. Then, in midsummer of the year 79, the fires burst their bonds of centuries and buried Pompeii under twelve or fifteen feet of ashes and cinders. Lord Lytton gives a graphic description of the catastrophe in his novel *The Last Days of Pompeii*. Of a population of about 20,000, almost 2,000 perished. To realize the extent of the destruction, one must stand among the ruins as they are to-day. In addition to the lava, there were showers of wet ashes and of cinders, which, on drying, thoroughly sealed up the place. Its buildings, therefore, have been brought to light in a remarkable state of preservation.

The eruption changed the entire geography of the region. It turned the river back from its course and raised the sea beach, so that there was no way of locating the former site of Pompeii. For nearly seventeen centuries it lay buried beneath its lava bed, until gradually its very name was almost forgotten. Then, by a happy accident, interest in the three lost cities was revived. In 1748 a peasant digging in a vineyard near Naples struck a wall. This resulted in extensive excavations in the region, and from that time, the work of recovery has been carried on according to a systematic plan, for which appropriations are made by the Italian government.

Excavations. Over half of Pompeii has been unearthed, so that the visitor may now see buildings as they stood almost twenty centuries ago, and walk in and out of houses and up and down narrow lanes, just as did the light-

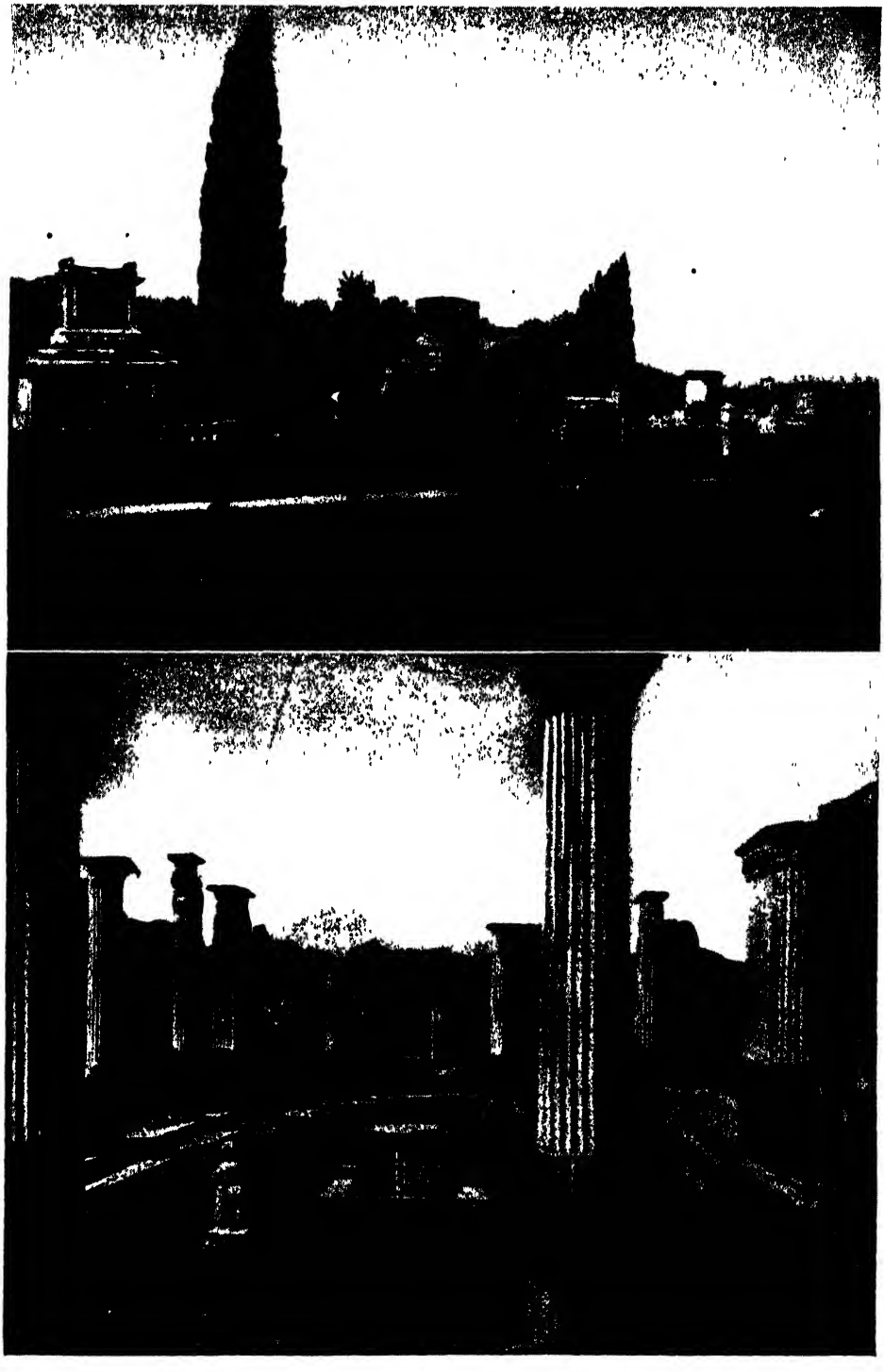


A GARDEN RESTORED

Buried for centuries under the lava of Vesuvius, it now delights modern eyes

hearted, happy Pompeiians of their day. Foremost among the excavations which have been brought to light are the forum and its surrounding buildings, the Temple of Jupiter (itself a ruin at the time of the eruption), the basilica, or town hall, and the temples of Apollo and of Fortuna Augusta. A considerable part of the city wall has been uncovered. But the unearthed private homes are of greater interest than the public buildings, as they afford such interesting glimpses of the social customs of that far-away period. Not many valuables have been recovered, as it is supposed the fugitives from the city carried these away with them. Near Boscoreale, a costly silver table service was found at the bottom of a well, and each day workmen are finding new domestic treasures.

Many thousands of objects, including statues and articles used in the daily life of Pompeii, are preserved in the National Museum at Naples, about thirteen miles distant. In a small museum near the entrance of the exca-



Pompeii the Beautiful. Excavations have brought to view the imposing tombs, shown above, and the home of an aristocrat, Marco Olconio. Vesuvius, which destroyed the city, is in the far background.



Found in the Homes of Pompeii. At top, toilet articles. Below, at left, a vase; below that, a safety pin At right, on two shelves, glass vessels. At the bottom of the illustration, style of wall decoration.

5724

vated city, interesting relics are also housed. In the National Museum likewise are to be found many treasures removed from Herculaneum. See HERCULANEUM; VESUVIUS; PLINY (the Elder).

POMPEY (106-48 B.C.), the common English form of the name of GNAEUS MAGNUS POMPEIUS, the great Roman general and a member of the first Triumvirate. His first military training was received under his father in the war between Marius and Sulla, but he first did real personal service by his aid to Sulla in 83 B.C. By his own efforts he raised three legions and defeated the Marian armies in Italy, winning thus the command against the party of Marius in Africa and in Sicily. Victorious in both places, he received on his return to Rome a triumph, an unheard-of honor for a young man who had not already attained to public office.



Photo: Visual Education Service

BUST OF POMPEY

Early Service to the State. When Lepidus attempted to overthrow the constitutions of Sulla, Pompey effectually opposed him, and in 76 B.C. was sent to Spain, where the Marian party was still very strong. Even Pompey could make no headway there, but after the murder of the leader Sertorius, he easily overcame all opposition, and on his return to Rome, in 71 B.C., was given the post of consul, with Crassus as his colleague. Meanwhile, though the people idolized him, the aristocratic party had come to look upon him with doubt because he seemed to be influenced by popular demands, and he proved the justice of their suspicions by restoring the office of tribune of the people. His military powers could not be denied, however, and in 67 B.C., he was entrusted with the task of freeing the Mediterranean of pirates. This difficult task he accomplished in forty days. The next year he was placed in command in the Mithridatic War, Cicero delivering one of his most famous orations in favor of his appointment.

First Triumvirate Formed. Pompey brought that long-drawn-out struggle to a close, subduing Pontus, Armenia, and Syria, and capturing Jerusalem, entering, it is said, the Holy of Holies in the Temple there. The Senate, however, still mistrusted him and refused to ratify his conduct of affairs in Asia, and in order to advance his interests, he formed a coalition with Julius Caesar. Crassus, with whom Pompey had quarreled, was also reconciled and brought into the alliance, which thus became the famous First Triumvirate.

Pompey was married to Caesar's daughter Julia, and the two promised to respect each other's ambitions, but Pompey grew jealous of Caesar's ever-increasing fame, and, after Julia's death, openly turned against him. He induced the Senate, now more afraid of Caesar than of him, to demand that Caesar relinquish his command, but this the latter refused to do unless Pompey should resign his offices. Pompey in his turn refused, and Caesar, who was on a campaign in the north, promptly crossed the Rubicon and marched on Rome.

Flight and Death. Fleeing to Thessaly, Pompey was completely defeated by Caesar at Pharsalia, and escaped to Egypt; but as he was landing from his boat, he was killed by one of his old centurions. His head was afterward presented to Caesar, who refused to look upon it and ordered the murderer's death.

Pompey was a remarkably successful general, but for most of his achievements, the way had been paved by the long and toilsome work of others. He was not a statesman, but deserved honor for the uprightness of his private life.

Related Subjects. The following articles in these volumes will make clear the references in the above article on Pompey.

Caesar, Caius Julius	Rubicon
Consul (The Roman Consul)	Sulla, Lucius Cornelius
Crassus, Marcus Licinius	Tribune
Lepidus, Marcus Aemilius	Triumph
Marius, Caius	Triumvirate
Mithridates	

PONCA. See INDIANS, AMERICAN (Most Important Tribes).

PONCE, *pone' say.* See PORTO RICO (The Cities).

PONCE DE LEON, *pone' thay day la' ohn,* JUAN (about 1460-1521), a Spanish conqueror and explorer, who discovered Florida while engaged in an effort to locate a fabled "fountain of perpetual youth." He served in the last war against the Moors in Spain, was with Columbus on his second voyage, and later was governor of the eastern part of Hispaniola (Haiti). His conquest of Porto Rico led to his appointment in 1510 as governor of that island, but his ambitions were not satisfied. He had heard from the Indians of an island named Bimini, which contained a marvelous fountain, in the waters of which old age could be thrown off and youth renewed, and in search of this he set out in March, 1513.

Land was sighted on March 27, and on Easter Sunday, April 8, he formally claimed the territory, which he named Florida, from *Pascua Florida,* the Spanish name for Easter. Eight years later he returned to colonize his new

territory, but was wounded in an encounter with the Indians and died soon after, in Cuba. See FLORIDA (History).



Photo above. Brown Bros.

PONCE DE LEON AND HIS SHIP

In 1913 Florida celebrated the four hundredth anniversary of its discovery. The lower illustration is from a photograph of the ship of the voyager, as reproduced for the occasion.

POND LILY. See WATER LILY.

PONS, *ponz,* THE. See BRAIN.

PONS ASINORUM, *ponz as ih no' rum.* See GEOMETRY (Some Famous Theorems).

PONTCHARTRAIN, *pon chahr trayn',* a beautiful lake in Louisiana, noted as a summer resort and of late years coming into prominence as a shipping base. It is situated about five miles north of the center of New Orleans, with which it is connected by the Bayou Saint John, a canal, and a railroad. The lake is about forty miles long and twenty-five miles wide. It communicates with Lake Borgne on the east and with Lake Maurepas on the west. A ship canal eastward to the Gulf of Mexico shortens the distance between New Orleans and the sea. A bridge across the lake was completed in 1929. See NEW ORLEANS.

PONT DU GARD. See AQUEDUCT (In Former Times).

PONTIAC, *pon' tih ak* (about 1720-1769), an American Indian chief, born in Northern Ohio. He early became chief of the Ottawa Indians and leader of the united tribes of Ojibways, Potawatomies, and Ottawas, and he led their warriors against Braddock in 1755. He was friendly with the English in 1760, but in that year was enraged by their advances into what he considered his domain. He determined to exterminate the British settlers of America, and during the next two years organized the



Photo. Chicago Historical Society

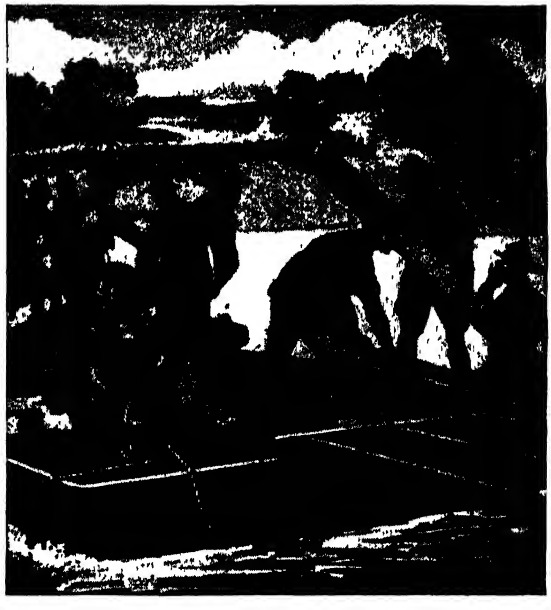
PONTIAC, THE OTTAWA CHIEFTAIN

greatest confederacy ever known among savage people. It extended from the northern shore of Lake Superior to the Gulf of Mexico, and included practically every Indian tribe in the Mississippi Valley. How he contrived to keep this vast movement a secret for more than two years is yet a mystery to historians.

On May 7, 1763, Pontiac attempted unsuccessfully to gain admission into Detroit. Eight

of the other frontier forts were captured, and several hundred soldiers and immigrants were massacred. Pontiac stubbornly held his ground before Detroit until the end of October, 1764, when the starving defenders received aid. . As peace had been declared between England and France, the chief could no longer receive French assistance, so he withdrew into Ohio. On July 25, 1766, peace was formally arranged at Oswego, N. Y. In 1769 Pontiac was murdered at Cahokia, Ill., by a Kaskaskia Indian, and in revenge the Ottawas and their allies made war on the Illinois tribes, practically exterminating them. As an organizing genius, Pontiac probably had no equal among American redmen

PONTIAC, MICH., the county seat of Oakland County, is situated in the southeastern part of the state, on the Clinton River, twenty-five miles northeast of Detroit. Pontiac is the center of an important industrial district, and is the northern terminal of the new Wider Woodward Highway, a 200-foot highway connecting the city with Detroit. Population, 1928, 61,500 (Federal estimate).



SOLDIERS CONSTRUCTING A PONTOON BRIDGE

General Description. Pontiac is beautifully located among wooded hills, and is surrounded by a large number of spring-water lakes in a region noted for hunting and fishing. Eleven parks, established by the state, are in Oakland County, within a short distance of the city. There are about 130 miles of well-kept and tree-lined streets bordered with many beautiful residences. Adjacent to the city are many excellent farms and country estates.

Transportation. The city is served by three lines of the Grand Trunk Railroad (Canadian National), two electric railways, and several bus lines which provide service to the neighboring towns and villages.

Industries. Prominent among Pontiac's industrial enterprises is the General Motors Corporation, which has three large subsidiary plants in the city. Here also are manufactured radio sets, paint and varnish, brick and clay products, forgings, brushes, flour, and iron and machine-shop products.

Institutions. Among the educational institutions of the city are a junior college, the Oakland County Normal Training School, and eight public and various parochial schools. A few miles distant are the universities of Michigan and Detroit. The Pontiac State Hospital, covering 780 acres, and ministering to the needs of thirteen counties, is located here. Saint Mary's Seminary, a theological school for Polish young men, is at Orchard Lake, five miles away.

History. Pontiac became the center of flourishing industries at an early day, the manufacture of buggies taking the lead. From this enterprise have developed the great automobile plants of to-day. The place was settled in 1818 and was named in honor of the Ottawa Indian chief Pontiac (which see). It was incorporated as a village in 1837, and received a city charter in 1861. Pontiac has the commission-manager form of government.

PONTIFEX, *pon' tih feks,* the title borne by each of the members of the sacred society of ancient Rome known as the College of Pontiffs. It was probably so named because its members were required to see that a certain bridge (*pons*) over the Tiber was kept repaired. To this college was entrusted the guardianship of all the rites and ceremonies connected with the worship of the gods. It also had charge of the calendar. Originally, there were three pontifices, but the number gradually increased to sixteen. At the head of the college was the *pontifex maximus,* an official who held office for life and could not leave Italy. At the present time the latter title is borne by the Pope.

PONTIFEX MAXIMUS, the title of the Pope, as head of the Roman Catholic Church. See PONTIFEX; POPE

PONTIFF. See POPE.

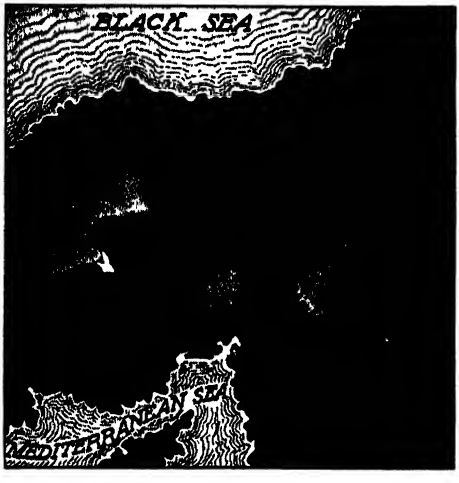
PONTIUS PILATE. See PILATE, PONTIUS.

PONTOON, *pon toon'.* In the engineering corps of every army there is a division whose special work is the construction of temporary bridges. Such a bridge consists of a roadway of timber laid across a line of floating supports called *pontoons.* The pontoons may be flat-bottomed boats, metal cylinders, or canvas-covered frames of bamboo. All the necessary ma-

terials for a bridge are carried by each pontoon division. The work of bridging a stream is done with mechanical precision, for in time of peace, the pontoon division of a standing army practices all sorts of maneuvers in bridge-laying. The chief danger arises when the work is done under fire from the enemy. The soldiers lay the flooring, section by section, fastening it securely to the pontoons, which are placed side by side, a few feet apart. Each pontoon has an upstream anchor, and at least every other one a downstream anchor, as well.

Pontoon bridges are of limited strength, and in crossing them, infantry must break step to prevent the swaying that would result from marching in time. Horses are led across, unmounted, and troops and wagons are kept certain distances apart. A river 600 feet wide can be bridged in less than an hour and a quarter, under favorable conditions.

PONTUS, the ancient name of a region in the northeastern part of Asia Minor, bordering on the Black Sea. Originally, Pontus was a



LOCATION MAP

The black area is Pontus; (*a*) is ancient Armenia, (*b*) Bithynia; (*c*) Galatia; (*d*) Cappadocia.

part of Cappadocia, but in the third century B.C., it was formed into a separate kingdom and rose to great power under Mithridates the Great (135-63 B.C.). Pontus was conquered in 63 B.C., by Pompey, and under the Romans was an important point in their advance toward the Euphrates. In 1204 Alexius Comnenus formed a new kingdom in Pontus, which existed until conquered by Mohammed II in 1461.

The southern and eastern portions of Pontus are mountainous, but along the coast the land is very fertile, and still produces grain, fruit, and timber in abundance. In ancient times, Pontus was noted for the culture of bees, and honey and wax formed the chief articles of commerce. See ASIA MINOR; MITHRIDATES.

PONTUS EUXINUS, *pon'tus uk' sin us*, the ancient name of the Black Sea (which see).

PONY. See illustration, page 3250.

PONY EXPRESS, a system of overland mail transportation, in which ponies were employed in relays. The route extended from Saint Joseph, Mo., to San Francisco, a distance of 1,050 miles. The system was started in 1860. Mail formerly was sent to the Pacific coast by way of Panama, but the pony express cut the time eight days. The riders were frequently attacked by Indians, and many are the interesting tales of adventure that have been handed down by the hardy pioneers who furnished the riders for this service. The pony express continued for eighteen months, but was superseded by telegraphic communication, begun in 1861, and the stagecoach. See MONTANA.

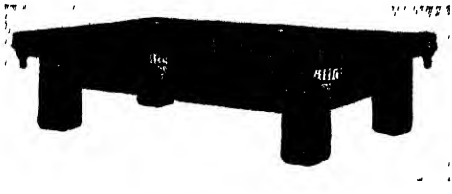
POODLE, *poo' d'l*, the name of a breed of dogs much favored as house pets because of their intelligence and affectionate ways. The variety most commonly seen has a thick coat of white, curly hair, which may be clipped as fashion or the whim of the owner decrees. Other poodles are black, and still others are reddish. The hair may be short and tightly curled, or it may hang in ropelike cords. Poodles vary in weight from twenty to forty pounds; they are well built, active, and graceful. See DOG. M.J.H.

POOL, the name of a number of different games played on a table similar to a billiard table, except that it has six pockets into which to roll the balls. Although pool is of later origin than billiards, the game suggests a return to the first-known billiard tables, which had pockets or holes like those in a bagatelle board, generally six in number. The modern pool table measures five by ten feet, standard size, but the tables used in public pool rooms are generally four feet six inches by nine feet, the same size as the average billiard table. There is one pocket at each corner, and one in the center of each side. See BILLIARDS.

Pyramid Pool. This is one of the most popular forms of pool. It is played with fifteen balls, of different colors and numbered from 1 to 15, and a white cue ball. The opener of the game plays with the white ball from anywhere behind the string, or balk line, at the fifteen balls, which are placed in triangular, or *pyramid*, formation at the opposite end of the table. The ball marked 1 forms the apex, standing on what is known as the *red spot*. After the first stroke, the white ball must be played just as it lies, regardless of the string. The first player must strike the pyramid hard enough to send at least two balls to the cushion, or at least one into a pocket. When only two are playing, the player who first scores eight by forcing eight balls into the pockets wins the game. Or the game may be decided in favor of the player whose score is greatest by adding

the numbers on the balls pocketed. The total of the numbers on the balls is 120; the player who scores 61 wins.

In one form of game, the player must call the number of the ball he intends to pocket, and if the one called is not pocketed, though others may be, no ball is counted by the striker. All pocketed balls except the one called must be returned to the table. When the ball called is pocketed, the striker is entitled to count all others that are forced in by the same stroke. A player forfeits one ball when he shoots and misses a ball, for forcing the cue ball off the



POOL TABLE WITH SIX POCKETS
Some tables are equipped with but four pockets, placed at the corners

table, or for pocketing the cue ball. A ball pocketed and scored by the striker must, when forfeited, be replaced on the table, on or as nearly as possible behind the red spot. If the striker incurs a forfeit before he scores a ball, the first ball pocketed by him must be replaced on the table.

Rotation Pool. In this form of game, the players must endeavor to pocket the balls in consecutive order, or rotation, from number 1 to 15. On any shot, if the required ball is not pocketed, any other balls which may be pocketed must be returned to the table; if the required ball is pocketed, all other balls which may be pocketed on the same stroke are counted by the player.

Bottle Pool. This game is played on a pool table with three balls and a pool bottle. The 1 and 2 pool balls are used, and a white one for cue ball. The pool bottle is placed upside down on the center spot; the 1 and 2 balls must be placed at the foot of the table, one near each pocket, the right distance being marked by the diamond nearest each pocket on the rail of the pool table.

The first player strikes the cue ball from anywhere behind the string, aiming at the 1 or 2 ball, according to choice. The game consists of 31 points, and the player having the lowest score is adjudged the loser. Any number can play, each following in rotation, playing with the same cue ball. The scoring is as follows:

Carom on the two balls	1 point
Pocket the 1 ball	1 point
Pocket the 2 ball	2 points
Carom from ball and upsetting bottle	5 points

A player who makes more than 31 is *burst*, and must start afresh.

Pin Pool. This game requires two white balls, one red ball, and five wooden pins which are set on the table as shown in the accompanying diagram, with the 1 pointing to the head of the table.



The center pin (5) is black, and the value of the other pins, which are usually plain wood, is marked in chalk on the cloth alongside, where it may be seen by the players. The red ball is placed on the red spot, as in billiards. One white ball is placed on a spot in line with the center of the table, three inches from the cushion, with the pins between it and the red ball.

Each player receives a small ball with a number, keeping to himself the knowledge of the number. The pool is won by the player who scores exactly 31 by knocking down pins to make exactly that number when added to the number on his concealed ball. If a player makes more than 31, he *bursts*, and must start over again.

Caroms on the two balls count nothing. Only pins count. There is no forfeit for a miss or for forcing a ball off the table. If by the cue ball or object balls the four outside pins are knocked down, leaving the 5 standing, the player wins the pool regardless of his score. This is called a *natural*.

POOL (in economics). See TRUST.

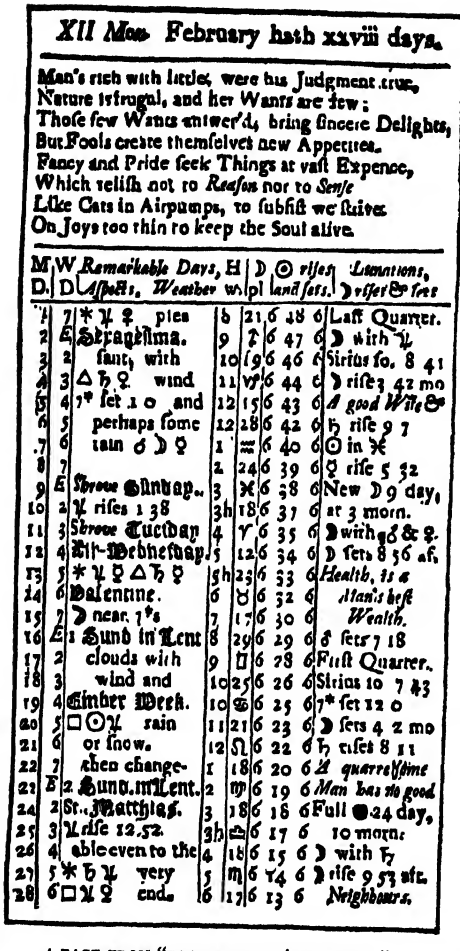
POOLS, WHEAT. See CANADA (Agriculture); COOPERATION (In Canada).

POONA, *poo' nah.* See INDIA (Cities).

POOR CLARES, *klairz*, a religious order of the Franciscans (which see).

POORE, HENRY RANKIN (1859-), an American artist, was graduated from the University of Pennsylvania in 1883. He studied art in Philadelphia and New York, then took courses in Paris. He came into prominence as an animal artist, then turned his attention to landscapes; in many of the latter, animals, particularly dogs, figured prominently. In addition to his work with the brush, he became an instructor in the Pennsylvania Academy, and in 1888 was made an associate member of the National Academy.

POOR LAWS, a term which describes the general mass of legislation designed to assist the dependent poor. These laws are based on the theory that, while the individual has duties he must render to society, he also has claims on society; among others is the right of assistance when he, on his part, is unable to secure the necessities of life. All civilized nations make laws covering such cases, but only recently have such regulations formed the subject of scientific investigation.



XII Mon. February hath xxviii days.

Man's rich with little, were his Judgment true.
Nature is frugal, and her *Wants* are few;
Those few Wants answer'd, bring sincere Delights,
But Fools create themselves new Appetites.
Fancy and Pride seek Things at vast Expence,
Which relish not to *Reason* nor to *Sense*
Like Cats in Airpumps, to subsist we strive.
On Joys too thin to keep the Soul alive.

M.	W.	*Remarkable Days, Aspects, Weather*	H.	☽ pl	☉ *rises and sets.*	☽ *rises & sets*	*Lunations,*
1	7	✶ ☿ ♀ pies	6	21	6 48	6	Last Quarter.
2	E	Stragesima.	9	♐	6 47	6	☽ with ♆
3	2	faint, with	10	♑	6 46	6	Sirius so. 8 41
4	3	△ ♄ ♀ wind	11	♒	6 44	6	☽ rise 3 42 mo
5	4	7* set 1 0 and	12	♓	6 43	6	*A good Wife &*
6	5	perhaps some	12	♓	6 42	6	♄ rise 9 7
7	6	rain ♂ ☽ ♀	1	♈	6 40	6	☉ in ♓
8	7		2	♈	6 39	6	♀ rise 5 52
9	E	Shrove Sunday.	3	♉	6 38	6	New ☽ 9 day,
10	2	☿ rises 1 38	3h	♉	6 37	6	at 3 morn.
11	3	Shrove Tuesday	4	♊	6 35	6	☽ with ☌ & ♀.
12	4	Ash-Wednesday.	5	♊	6 34	6	☽ sets 8 56 af.
13	5	✶ ☿ ♀ △ ♄ ♀	5h	♋	6 33	6	*Health, is a*
14	6	Valentine.	6	♋	6 32	6	*Man's best*
15	7	☽ near 7*s	7	♋	6 30	6	*Wealth.*
16	E	1 Sund in Lent	8	♌	6 29	6	♂ sets 7 18
17	2	clouds with	9	♌	6 28	6	First Quarter.
18	3	wind and	10	♍	6 26	6	Sirius 10 7 ♑
19	4	Ember Week.	10	♍	6 25	6	7* set 12 0
20	5	□ ☉ ☿ rain	11	♎	6 23	6	☽ sets 4 2 mo
21	6	or snow.	12	♎	6 22	6	♄ rises 8 11
22	7	then change-	1	♏	6 20	6	*A quarrelsome*
23	E	2 Sund. in Lent.	2	♏	6 19	6	*Man has no good*
24	2	St. Matthias.	3	♐	6 18	6	Full ● 24 day,
25	3	♅ rise 12.52.	3h	♑	6 17	6	10 morn.
26	4	able even to the	4	♑	6 15	6	☽ with ♄
27	5	✶ ♄ ☿ very	5	♒	6 14	6	☽ rise 9 53 aft.
28	6	□ ♅ ♀ end.	6	♒	6 13	6	*Neighbours.*

A PAGE FROM "POOR RICHARD'S ALMANAC"

Since the beginning of the present century, Great Britain has made a thorough study of conditions in that country, and has adopted radical changes in the methods employed for helping dependents. The acts providing for old-age pensions and national health and unemployment insurance have greatly relieved demands on the poor laws. In the United States and Canada, care of the indigent is a recognized branch of social-research work, supplementing state and provincial laws for the relief of the needy. The ideal sought is the providing of needed relief in such a way as not to weaken the self-respect of the recipient or encourage poverty. See OLD-AGE PENSIONS; CHARITY. L.L.B.

POOR RICHARD'S ALMANAC, the name given by Benjamin Franklin to the almanac which he published from 1732 to 1757, under the assumed name of *Richard Saunders*. Besides the usual material which an almanac contains, this publication of Franklin's had a large store of maxims and advice on such subjects as honesty, industry, frugality, and patriotism. In the new country, where literature was none too plentiful, this almanac, with its wholesome common sense and its yearly sale of 10,000 copies, had a wide influence. Many quotations which are in everyday use are from *Poor Richard's Almanac*; among them are the following:

A penny saved is a penny earned.

Early to bed and early to rise
Makes a man healthy, wealthy, and wise.

God helps them that help themselves

Never leave that till to-morrow which you can do to-day.

Three removes are as bad as a fire.

Little strokes fell great oaks.

POORWILL. See WHIP-POOR-WILL.

POPCORN. See CORN (Varieties).



POPE, *pohp*, the name of the father or spiritual ruler of the Roman Catholic Church, which great organization regards him as its visible head, Christ being the invisible head. The office of Pope was founded on the words of Christ: "And I say also unto thee, That thou art Peter [which means *a rock*], and upon this rock I will build my Church; and the gates of hell shall not prevail against it" (*Matthew* XVI, 18). The attention of every historian has been attracted by the endurance of the Papacy through centuries that have seen the downfall of every other European institution that existed when the Papacy arose, and of a number of others that have originated and fallen, while it continued to flourish. The Roman Catholic offers these facts as evidence that the Church is not merely a human institution, but that it is built "upon a rock," despite the human weaknesses that have manifested them-



Photo: Keystone

THE POPE'S PRIVATE AUDIENCE ROOM IN THE VATICAN

selves with the changes of time. The government of the Pope in spiritual matters is supreme, and through the power vested in him and the divine assistance claimed for him as the successor of Saint Peter, his teachings in doctrinal matters when he speaks *ex cathedra*, that is, in discharge of his office, are accepted as infallible.

Insignia of Office. The Pope ordinarily wears the garb of the other bishops, but this is always white in color; his shoes alone are different, being low, open shoes, red in color, with a cross embroidered on the front. He wears out-of-doors a low, broad-brimmed hat. The tiara, the pontifical headdress, is used only in procession. His liturgical vestments are those of the bishops, except that the cope has a clasp ornamented with precious jewels, and for headdress he wears the miter. The pontifical ring and the cross of gold, said to contain a relic of the true Cross, constitute his jewels. He is addressed as "Your Holiness."

Election of the Pope. The Pope is elected by a two-thirds vote of all the cardinals, who assemble as the College of Cardinals especially for that purpose. This elective assembly is called the Conclave. Their number varies from sixty to seventy, according to different Papal appointments. Closeted in a room which is made absolutely secure from intrusion and outside influence, they remain for hours or days, as need be, previous to the election, seeking divine assistance, through prayer, asking for the guiding light to direct them in their choice. The smoke issuing from the ballots, which are burned in the Sistine Chapel after the election, proclaims to the eager, excited throngs awaiting outside that a choice has been made. The elected candidate is clothed with the white Papal soutane in the sacristy of the Sistine Chapel, and receives the homage of the cardinals. Upon his accession to the throne, the Pope assumes a new name. Owing to the geographical position of Rome, and the fact that Italian cardinals have usually been in the majority, the Popes for centuries have been Italians. The last one of foreign birth was Adrian VI, of Utrecht, who was elected in 1522.

Vicissitudes of Papal Power. The date of Peter's first appearance in Rome is disputed, but critics quite generally agree that he was there in A.D. 64, when the Christian community was already established, and that he built a church and suffered martyrdom there in the time of Nero. During the fourth and fifth centuries, the Roman Primacy was enhanced in power, and definite recognition of its spiritual supremacy was manifested when Leo the Great, from 440 to 461, endeavored to preserve the Greek Church from the degeneracy into which it had fallen. Accordingly, in 451 a conclave of 630 bishops and four Papal legates

assembled to hear the decree of Leo; they are reported to have exclaimed unanimously: "What Leo believes we all believe; anathema to him who believes anything else. Peter has spoken by the mouth of Leo." Despite the fact that the people of the East received the decree with resentment, all Italy turned to Leo when Attila, King of the Huns, devastated Europe and appeared before Rome. Upon being met by Leo, he withdrew without attack. Again the city was spared from fire and sword through Leo's influence with Genseric, leader of the Vandals. During the next 300 years, the Papacy carried through one of the most extensive tasks ever undertaken by an historic institution, that of spreading its faith among the Anglo-Saxons, the Visigoths, the Franks, and the Lombards. About this time the Benedictine Order of Monks was founded, and they initiated the work of civilizing Europe. It was not until the seventh century that the primacy of the bishop of Rome was generally accepted. In 800, when Leo III, on Christmas Day in Saint Peter's Church, crowned Charlemagne Emperor of the West, pagan Rome lost its influence in the world. The Popes now claimed the right to crown the emperors, but they in turn asserted the right to confirm the election of the Popes.

The power of the Papacy gradually increased, literature was revived, and the soil of art and science was made fertile. However, in the midst of this power, the condition of the Papacy reflected the evils of the times; it became spiritually weakened by corrupt administration and disorders in elections, and by the sale of bishoprics and church property for personal gain. Church officers became the vassals of lords; consequently, it is not surprising that men were appointed to the Papacy merely in the interest of their rulers. These practices were checked when Otto the Great in 962 was crowned emperor. In less than 100 years, the Roman clergy and laity were again empowered to select the Pope. In the middle of the eleventh century, Pope Nicholas instituted the College of Cardinals, which was to choose the Pope, the choice to be confirmed by the emperor and approved by the clergymen and laity.

The pontificate of Gregory I (590 to 604) is a luminous period in Papal history; he insisted on the celibacy of the clergy and suppressed simony (buying and selling ecclesiastical offices), thereby accomplishing much for the spiritual elevation of the Papacy. During the pontificate of Innocent III (1198-1216), nearly every European ruler submitted to the sovereignty of the Church. One of the heaviest blows to the temporal and spiritual power of the Pope was the removal of the Papal court from Rome to Avignon, France, in 1305, by Clement V, when the "seventy years' captivity" began. During this period, all the Popes were French, and French influence prevailed, which greatly diminished Papal prestige. The return of the Popes to Rome was the beginning of the Great Schism of the West, but the Council of Constance restored order by the election of Martin V, in 1417. The Protestant Reformation, started within the Church, ended in a Protestant denial of the dogmatic and moral teachings of the Church. The answer of the Roman Church was defined by the Council of Trent (1545-1563).

The temporal sovereignty of the Pope received another severe blow when Napoleon Bonaparte annexed the Papal States in 1797. However, by the Treaty of Vienna (1815), the States were restored to the Papacy under the protection of Austria. In this position, the Papal States shared in the hatred of patristic Italians of the foreign oppressor. During the struggle for the unification of Italy (1848-1870), all the temporal provinces of the Papacy were confiscated, and for sixty years, beginning with Pius IX, who ruled the Church from 1846 to 1878, the Popes remained voluntary prisoners in the Vatican.

Leo XIII and his successors followed a policy of extension and consolidation of Papal authority, which increased the spiritual power of the Papacy Pius X is credited with reconstructive and reformative work which did more for the Church than had been accomplished since 1590. The shocks and horror of the outbreak of the World War in 1914 hastened the death of Pius. He was succeeded by Benedict XV, who continued the Papal policy of a strict neutrality, not of indifference, but of impartiality.

In 1929 an agreement of utmost historic importance was reached between the Italian Fascist government and Pius XI, who acceded to the Papacy in 1922. A settlement of the dispute of sixty years' standing is found in two documents—the treaty, which has international value, and the Concordat, which is national in scope and concerns only relations between the Vatican and the Italian state.

On July 25, 1929, a Pope emerged from the Vatican for the first time since 1871, when Pius XI entered Saint Peter's Square in the midst of a gorgeous ecclesiastical procession which was witnessed by 250,000 people, thus signalizing the resumption of the temporal power of the Papacy in Italy and the end of the long controversy with the State (described in the article Vatican City).

As sovereign of the Vatican City, an area of about 105 acres and a population of some 500 people, the Pope has a definite diplomatic status. His right to send diplomats to foreign countries and to receive foreign representatives is recognized.

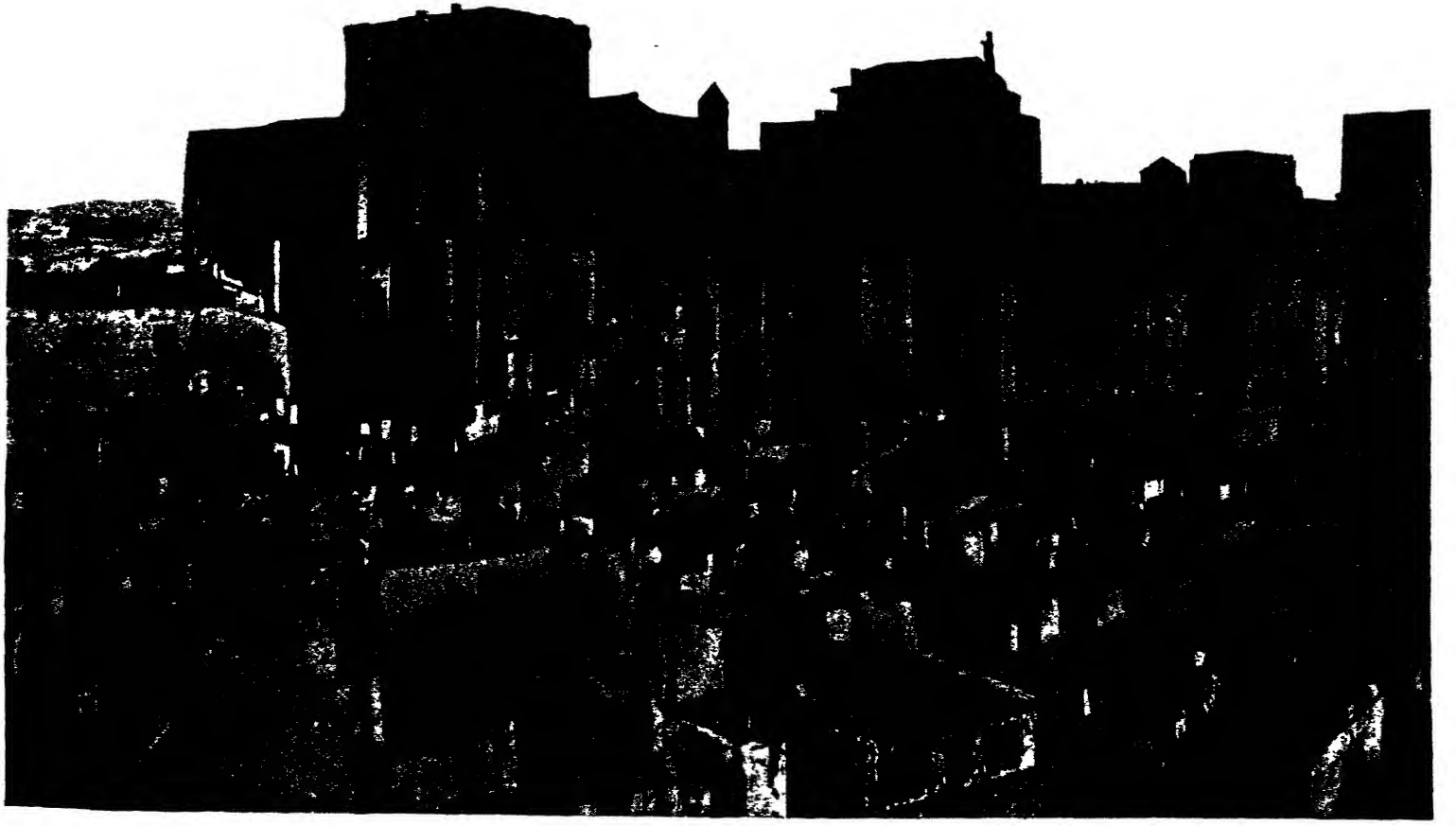


Photo: U & U

Palace of the Popes at Avignon. A splendid view of the former center of the temporal and spiritual power of the papacy in France. The palace was begun by Pope John XXII in 1316, and completed by Urban V in 1364. The lofty walls are thirteen feet in thickness.

5733

By the terms of the Concordat, canon law is recognized; a change which means less in a country normally ninety-nine per cent Catholic than it would in a non-Catholic country. Marriage by the Church is legal, and religious education in the schools is compulsory.

The Papacy received an indemnity from the Italian government, and religious communities and other ecclesiastics have the right to own property.

The income of the Pope is derived from the voluntary contributions of the faithful, known as "Peter's pence."

Subjoined is a list of the Popes, verified by the Roman Notizie (official register), with the dates of the beginning of their pontificates. The names of antipopes are printed in italics; an asterisk indicates that a biographical sketch is included in these volumes:

*St. Peter (the Apostle) . . . A.D 42
St. Linus . . 66
St. Anacletus . . 79
*St. Clement I . . 91
St. Evaristus 100
St. Alexander I. . 109
St. Sixtus I . 119
St. Telesphorus . 128
St. Hyginus . . 138
St. Pius I. . . . 142
St. Anicetus. . . 157
St. Soterus . 168
St. Eleutherius . 177
St. Victor I . 190
St. Zephirinus . 202
*St. Calixtus I—*Hippolytus* . 218
St. Urban I . . . 222
St. Pontianus. . . 230
St. Anterus . . 235
St. Fabian . . 236
St. Cornelius . 251
St. Lucius I—*Novatianus* 253
St. Stephen I 254
St. Sixtus II. 257
St. Dionysius 259
St. Felix I . . . 269
St. Eutychianus . 275
St. Gaius . 283
St. Marcellinus 296
(See vacant about 4 years.)
St. Marcellus I 307
St. Eusebius 309
St. Melchiades or Miltiades 310
St. Sylvester I . . 314
St. Marcus 336
*St. Julius I . . 337
Liberius—*St. Felix II* 352
St. Damasus I—*Ursmus* 366
St Siricius. 384
St. Anastasius I. 398
*St. Innocent I. . . . 402
St. Zosimus. 417
St Boniface I—*Eulalius* . 418
St. Celestine I . 422
St Sixtus III . 432
*St. Leo I, the Great 440
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*Calixtus II . . 1119
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Lucius III 1181
Urban III 1185
Gregory VIII 1187
Clement III 1187
*Celestine III . 1191
*Innocent III. . 1198
Honorius III 1216
Gregory IX . 1227
Celestine IV 1241
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Innocent IV . 1243
Alexander IV . . . 1254
Urban IV . . . 1261
Clement IV . 1265
(See vacant 2 years and 9 months.)
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Adrian V . . . 1276
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Honorius IV	1285
Nicholas IV	1288
(See vacant 2 years and 3 months)	
*St. Celestine V	1294
*Boniface VIII	1294
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Clement V (Papacy removed to Avignon, France)	1305
(See vacant 11 months)	
*John XXII	1316
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*Urban VI—*Clement VII*	1378
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*Sixtus IV	1471
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*Alexander VI	1492
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*Julius II	1503
*Leo X	1513
*Adrian VI	1522
*Clement VII	1523
*Paul III	1534
*Julius III	1550
Marcellus II	1555
*Paul IV	1555
*Pius IV	1559
*St. Pius V	1566
*Gregory XIII	1572
*Sixtus V	1585
Urban VII	1590
Gregory XIV	1590
Innocent IX	1591
*Clement VIII	1592
Leo XI	1605
*Paul V	1605
Gregory XV	1621
*Urban VIII	1623
Innocent X	1644
Alexander VII	1655
Clement IX	1667
Clement X	1670
*Innocent XI	1676
Alexander VIII	1689
*Innocent XII	1691
Clement XI	1700
Innocent XIII	1721
Benedict XIII	1724
Clement XII	1730
*Benedict XIV	1740
Clement XIII	1758
*Clement XIV	1769
*Pius VI	1775
*Pius VII	1800
Leo XII	1823
Pius VIII	1829
Gregory XVI	1831
*Pius IX	1846
*Leo XIII	1878
*Pius X	1903
*Benedict XV	1914
*Pius XI	1922

Antipope, an ecclesiastic elected, or claiming to have been chosen as Pope, in opposition to the Pope regularly or canonically chosen For political reasons, sometimes for religious reasons, certain factions in the Roman Catholic Church or certain European rulers opposed the authority of the Pope and supported an antipope in opposition In the days when the Pope had temporal as well as spiritual authority, political considerations often played the most important part in the election of the Supreme Pontiff. Otho I, Holy Roman Emperor, displaced two Popes for personal reasons; later emperors used military force to displace Popes, or set up antipopes; the kings of France frequently interfered, and even the kings of Sicily, a comparatively unimportant kingdom, sometimes set up antipopes in opposition to the Popes supported by the emperors.

The first antipope usually noted was Laurentius, elected in 498 in opposition to Symmachus, and the last was Felix V, a Duke of Savoy, who was elected in 1439. The most famous of the antipopes was elected after the death of Gregory XI, in 1378. Gregory was a Frenchman, but he removed the Papal See from Avignon back to Rome, where the cardinals proceeded to elect an Italian, Urban VI, as Pope. Shortly afterward, the French cardinals elected the antipope Clement VII, a Frenchman, who was recognized as Pope by France and Spain, while Italy, Germany, and the whole north of Europe except Scotland, supported Urban. This rivalry produced the Great Schism, or Great Schism of the West, which divided the Church for half a century.

Related Subjects. The reader is referred in these volumes to the following articles.

Cardinal	Rome
Papal States	Sacred College
Reformation, The	Vatican
Roman Catholic Church	Vatican City

POPE, ALEXANDER (1688-1744), the most eminent English poet of the first half of the eighteenth century. With Steele, Addison, Swift, and Defoe, he contributed to that period a literary excellence that has given it the name Augustan Age. Pope was born in London, of a Roman Catholic family. Because of his religion, his education was acquired in private schools and from tutors. Much of his learning, however, was the result of his own unaided and unsystematic study of languages and literature. He was unusually precocious, and composed an *Ode to Solitude* when but twelve years old. In 1719, having fully made up his mind to devote himself to poetry, which had always been first among his interests, he went with his mother to live in a villa at Twickenham on the Thames, where the rest of his life was spent.



ALEXANDER POPE

Though deformed and sickly, dwarfish in soul and body, "with little knowledge of the world of nature or of the human heart," he was the foremost poet of his age.

Pope is one of the most unusual of literary personalities. A hunchback from early childhood, and keenly sensitive to criticism, he was misled by his vanity and irritability into most malicious attacks on those who stirred up his envy or hatred. He turned on Addison, one of his best friends, and assailed him in an unjustifiable manner, but Addison bore it all with good humor. Pope was, however, capable of appreciation and of real loyalty to his friends, among whom were numbered such men as Swift, Gay, and Arbuthnot. The craving for approbation always drove him relentlessly, and most of his acts were dictated by it. As a poet he has been variously ranked by critics. In his own age his worth was overestimated, admirers declaring him the greatest of all English poets; in the following Age of Romanticism, he was as much underestimated. Certainly his polished couplets, though they produce

the effect of monotony and artificiality, have done much to make excellence of form a necessity of verse. Pope is much quoted—more, perhaps, than any other English poet except Shakespeare.

Two of his greatest works were published before 1719. These are the *Essay on Criticism*, in which the standards of literary judgment are set forth in elegant, flowing verse, and *The Rape of the Lock*, a mock-heroic epic, filled with sprightly humor and bright fancy and enlivened by the introduction of sylphs who control the development of the plot. *The Wife of Bath* and *The Temple of Fame*, adapted from Chaucer, next appeared. The most profitable of his undertakings from a money point of view was the translation of the *Iliad* and the *Odyssey*, the latter largely the work of assistants. Though excellent in themselves, these translations fail to preserve the simplicity of the original poems. Following these came *Bathos, or the Art of Sinking in Poetry*, and the famous *Dunciad*, both directed against critics and adversaries, and both bitter as only Pope knew how to be. The fourth book of the *Dunciad*, written on purpose to ridicule Colley Cibber, the poet laureate, was not added until seventeen years later. Pope's last works were the *Moral Essays*, including the much-quoted *Essay on Man*, and the excellent satires called *Imitations from Horace*.

Of his best-known sayings, the following may be regarded as typical:

Hope springs eternal in the human breast:
Man never is, but always to be, blest.

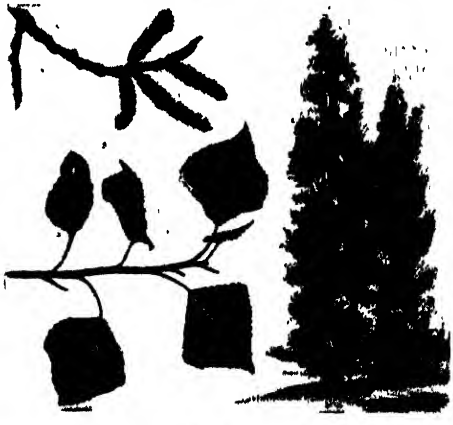
Know then thyself, presume not God to scan;
The proper study of mankind is man.

Vice is a monster of so frightful mien
As to be hated needs but to be seen,
Yet seen too oft, familiar with her face,
We first endure, then pity, then embrace.

An honest man's the noblest work of God

POPLAR. The poplars constitute a genus of rapidly growing trees belonging to the willow family. Like the willows, they are partial to moist places, and bear their flowers in drooping catkins, staminate and pistillate flowers being usually on different trees (see WILLOW). The tiny seeds have silky, cotton-like filaments by which the winds carry them through the air. Poplars are also characterized by their trembling leaves, for the long, straight stems are flattened at right angles to the blade, and a breath of air sets the leaves fluttering with a sound like falling raindrops. There are eleven species native to America, and they grow in almost all parts of the continent, supplying a light, soft wood suitable for such articles as boxes and packing cases, and valuable also for making paper pulp. For this purpose it is considered even better than spruce. Magazine paper contains seventy per cent poplar fiber. Poplars are frequently planted as shade trees because they reach maturity so quickly, but their roots have a tendency to clog underground pipes, and in some municipalities, planting them on streets is forbidden.

The *aspen* and *cottonwood*, both described elsewhere in these volumes, are well-known American species of poplar. Three European species have been introduced into America and are planted there more or less extensively. These are the *white*, the *black*, and the *Lombardy*. The white poplar can be recognized by



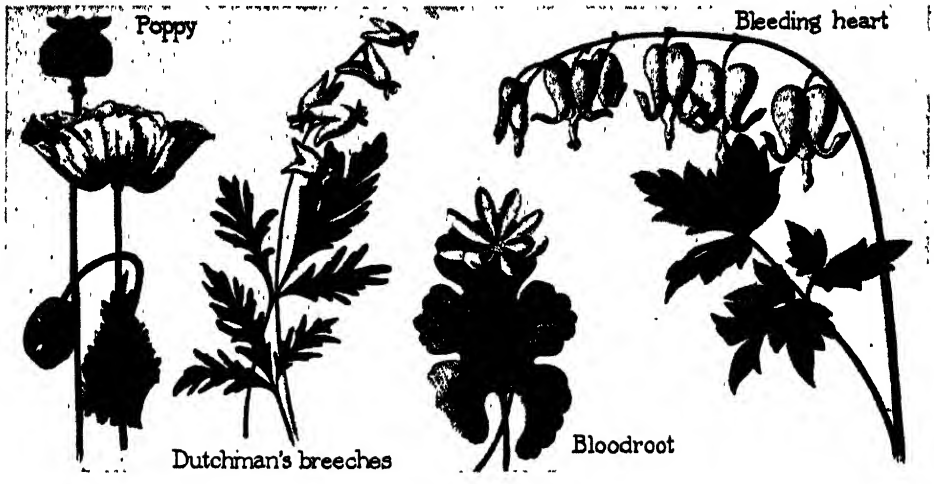
THE LOMBARDY POPLAR
Illustrating the form of the tree and appearance of the leaves and flowers The latter are in the form of drooping catkins

the downy lining of the foliage and the white bark of the branches. The smooth-leaved black poplar is a well-known tree in the Middle Atlantic states, but is not so generally known as the Lombardy poplar, a variety of the black. The Lombardy has a characteristic tall, gaunt appearance, suggesting an exclamation point. It is a favorite tree in Italian landscaping. In Western America the *balsam poplar*, or *tacamahac*, grows to a height of 200 feet. A variety called *balm of Gilead*, occurring in the East, may be distinguished by its broad heart-shaped leaves with hairy under sides. The buds of these two trees are laden with a fragrant gummy substance. G.M.S.

Scientific Names. The poplar genus is known scientifically as *Populus*, family *Salicaceae*. The white poplar is *Populus alba*, the black, *P nigra*, and the Lombardy, *P. nigra italica* The balsam poplar is *P balsamifera*, and the balm of Gilead, *P. balsamifera candicans*.

POPLAR, a name applied to the wood of the tulip tree. See TULIP TREE.

POPLIN, a fine-ribbed fabric made of silk, wool, cotton and silk, silk and wool, or wool and cotton. It derives its name (*popeline*, in French) from the fact that it was first made at Avignon, the seat of the Popes from 1305 to 1376. Just how the original *popelines* were



SOME MEMBERS OF THE POPPY FAMILY

made is not known, but it is thought they were chiefly, if not always, entirely of silk. The more common modern poplins of good quality add to the silk warp a worsted weft which gives the cloth softness and substance. The worsted filling, being much heavier than the warp, gives the cloth a corded effect. Poplins are made in all colors, and are used extensively for dresses and for rich upholstery.

POPOCATEPETL, *po po kah' ta pet'l,* a dormant volcano in Mexico, about forty miles southeast of Mexico City, one of the highest mountains in North America. It reaches an



Photo: Visual Education Service

POPOCATEPETL
A telephoto view of the summit of Mexico's great peak.

altitude of 17,876 feet, which is 2,424 feet less than the height of Mount McKinley, the loftiest peak on the continent. In the clear Mexican air, the great white-topped cone, rising above the dark green of the forests on the lower slopes, appears to one in Mexico City much nearer than it is. Though Popocatepetl has not been violently active for several centuries, clouds of smoke and gas, and sometimes ashes and stones, pour from its mouth; thus it earns its name, which in the language of the Aztec Indians means *smoking mountain.* Mining engineers sometimes send Indians up to the crater to obtain native sulphur, which is found there in great quantities. These workmen make the descent by sliding down the steep, snow-covered mountainside.

POPONOMING LAKE. See PENNSYLVANIA (Lakes and Rivers).

POPPY, the common name of a genus of flowering plants whose most important member is the white sleep-producing poppy of China, India, and Persia. This species, aptly called the "garden hypnotist," is extensively raised in the Orient for the opium obtained from the milky juice of the young capsule. The extraction of the drug is a delicate process that would be too expensive in countries other than those where labor is very cheap. For a statement of the effects of the use of opium and some of the international complications arising from its distribution, see the article OPIUM. See, also, MEDICINE AND DRUGS (What Medicines Are Beneficial).

The flowers of poppies are admired for the delicate silkiness of their petals and for their graceful poise on the stem. Under cultivation, numerous variations in the size and form of the blossoms have been brought about. The plants are hardy and are easy to cultivate. The tiny seeds have no narcotic properties, and are sold for bird food. They also yield an oil which is used in preparing dishes for the table and from which an oil cake is made that is a valuable cattle food. Poppy



Photo: U & U

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"IN FLANDERS' FIELDS THE POPPIES BLOW"

seeds also are used as a flavoring, sprinkled on loaves of bread and on rolls; and in a filling for cakes.

The common *red poppy*, a species that grows wild in the grain fields and grassy meadows of Great Britain and the continent of Europe, is the one referred to in the popular war-time poem *In Flanders Fields*, by John McCrae (see his biography in these volumes, for the words of the poem). The *Iceland poppy* is found in North America as far south as the mountain peaks of Colorado. Its flowers, in various shades of yellow, rose-pink, and scarlet, last longer than most of these short-lived blossoms. The *California poppy*, or "cup of gold," grows wild in profusion in the "Golden State." When Luther Burbank saw among these yellow poppies one touched with scarlet, he gave it special attention, and by cross pollination produced a scarlet poppy. The most showy of all the species is the large-flowered *Oriental poppy*, whose red-orange blossoms have conspicuous blackish-purple centers. B.M.D.

Scientific Names. The poppy family is *Papaveraceae* The opium poppy is *Papaver somniferum*; the red poppy, *P rhoeas*; the Iceland, *P undicaule*; the Oriental, *P. orientale*. The California poppy belongs to another genus, and is classed as *Eschscholtzia californica*

POPULAR SOVEREIGNTY, *sov' ur in tie.* See SQUATTER SOVEREIGNTY.

POPULATION. "The true greatness of a state consisteth essentially in population and breed of men," said the famous English philosopher Bacon. By *population of a country* is meant the total number of men, women, and children that compose the nation. The great truth contained in Bacon's thought is just beginning to be recognized—that the greatest asset of a nation is its number of healthy and happy men, women, and children.

Number and Rate of Increase. During the century following 1814, the population of the world more than doubled, an increase made possible by the opening of new lands in North and South America, Australia, New Zealand, and South Africa. Never before had such a rapid increase in population taken place. It is estimated that in 1814 the world had, in round numbers, 700,000,000 inhabitants, while in 1920, two years after the end of the World War, the population was about 1,820,000,000.

The following table gives (in millions) the population of the world, according to the estimates of leading statisticians:

DIVISION	1810	1920
Europe	180	451
North America	19	144
South America	2	67
Asia	380	956
Africa	99	132
Australasia	3	9

For the half century preceding the first years of the twentieth century, the rate of increase in several of the most rapidly growing countries was as follows: 190 per cent in the United States, ninety per cent in Russia in Europe, sixty-two per cent in Germany, fifty-nine per cent in England, forty-six per cent in Hungary, forty-one per cent in Austria, and ten per cent in France. For the whole of Europe the increase during that half century was fifty per cent, in spite of the fact that a large number of people left that continent to settle in other parts of the world, especially in America. The World War halted increase in Europe, and caused the death, directly and indirectly, of millions of men. At the present time, Argentina is increasing its population faster than any other country in the world; the United States comes next. In May, 1927, the secretariat of the League of Nations estimated the population of the world at 1,906,000,000.

Birth Rate. The increase in the population of the world has taken place in spite of the fact that the birth rate in most civilized countries has been steadily declining during the last few decades. To offset this, there has been a gradual decrease in the number of children who die before they attain their first birthday. Yet the number of these innocent victims of disease, poverty, and ignorance is still appallingly large.

Span of Life. Another factor that works for the increase of population is the fact that the span of life has lengthened; that is, that the average number of years each person lives is greater now than formerly. People have a better chance to-day to live a longer life than ever before. This is due to the progress made by the science of medicine, and to the greater attention paid both by individuals and by public authorities to hygiene.

Sex. Although throughout the world male births exceed female births, because of the hardier resistance of females and less exposure to accidents and the ravages of war, considering the population of the whole world, females predominate over males. In European countries the women outnumbered the men even before the World War shockingly decreased the male population. This disproportion between the sexes was especially pronounced among the nations of Western Europe —England, Sweden, Norway, France, and Germany. In North America and Australia, the male population predominates, being increased by the large immigration from the above-mentioned countries. Also in Canada, Egypt, South Africa, Japan, and India, men outnumber women.

Urban and Rural Population. A striking change has taken place in the distribution of the population during the last hundred years. This consists in the movement of the people

from the country to the cities, due to the great industrial development of the nineteenth and twentieth centuries. The percentage of people living in towns has shown steady advance, not only in Europe, but in less densely populated parts of the world, as Canada, Australia, and the United States. For example, only one-fifth of the population of England and Wales lived in cities in 1800, as against nearly four-fifths at the present time. In Germany less than one-tenth of the population were city dwellers in 1800, as compared with three-fifths now in cities. In France the increase was not so great; there only two-fifths of the population live in towns, as compared with one-tenth in 1800. In the United States this movement shows the greatest development. In 1800 the proportion of those living in cities formed only 3.8 per cent of the total population; now over half of the inhabitants—51.4 per cent of the total population—are living in cities.

Overpopulation. Many sociologists and social workers have come to fear an excess of population in comparison with the available food resources of the world. Malthus called attention to this possibility more than a century ago in his much discussed *Principles of Population*. While there is not much immediate danger of overpopulation in new countries such as the United States, Canada, Australia, and Argentina, it is well known that the excess of population in such countries as China and India, in contrast with the extent of their territory and the low state of their arts, leads periodically to famines and pestilence, in which thousands die of want. Something mildly comparable to this condition exists in occidental great cities, especially of the Old World, where it is estimated that frequently ten per cent or more of the population are constantly below the poverty line, and thousands are chronically underfed and underclothed, although few may actually die of acute starvation.

These facts have led many sociologists and social workers to consider the need for some rational method of limiting the population in overcrowded countries to the available food supply. Primitive methods of doing this were infanticide, human sacrifice, and war. More modern methods are commonly known as "birth control," although many of the birth-control methods have long been known and practiced. L.L.B.

Related Subjects. The reader is referred to the following articles in these volumes:

Baby	Life Extension
City	Life, Length of
Emigration	Malthus, T. B.

POPULIST PARTY, OR PEOPLE'S PARTY, one of the political parties in the United States that took a prominent part in the Presidential campaign of 1892. The official name was the PEOPLE'S PARTY, but as its members were called POPULISTS, this name became the accepted designation of the party. It resulted from the union of the several organizations which had existed as the result of unrest among the people. As a consequence of the unsettled state in which many questions of national policy were left after the close of the War of Secession, and the natural reaction from the inflation of war times, agricultural interests experienced a prolonged season of depression. This led to the formation of a number of farmer organizations, such as the Grange movement of 1867 and the Farmers' Alliance of 1879, whose object was to improve the condition of their members.

Some labor organizations, notably the Knights of Labor, were also thus attracted to the farmers' movement. The result was the organization of the People's Party, that being the name adopted by a convention of delegates from these different bodies, which met in Cincinnati in 1891. The following year the party formally organized for participation in the national campaign. James B. Weaver of Iowa was the party's nominee for President.

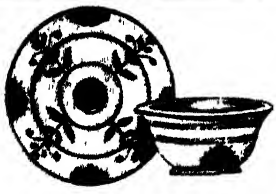
The most important planks of the platform adopted were those relating to finance. In general terms, the party favored the free coinage of silver, a great increase in the issue of paper money by the government, and its distribution directly to the people without the intervention of national banks. The aim was more direct contact of the people with the government, and acceptance by the government of real estate and non-perishable farm products as security. In addition, the convention adopted a number of planks not peculiar to their party but favored by many in both the old parties, such as postal savings banks, government ownership and control of public utilities, and the election of United States Senators directly by the people.

The net results of the fall election showed that the new party had won an important position in the United States. It polled over 1,000,000 votes, securing twenty-two Presidential electors, five Senators, and ten Representatives in Congress, about fifty state officers, and over 1,500 county officials and state legislators. In 1896 it accepted as its nominee the Democratic candidate for President, William J. Bryan, but nominated Thomas E. Watson of Georgia as its candidate for Vice-President. In 1904 and 1908, Watson was the party nominee, but he received only a few thousand votes. The party thereafter gradually disintegrated as many of the issues on which it was based were dropped or taken up by the major parties.

Related Subjects. The reader is referred in these volumes to the following articles:

Bryan, William J.	Political Parties
Grange	Watson, Thomas E.
Greenback Party	Weaver, James B.

PORCELAINS *from* MANY LANDS



HOLSTEIN - HOLLAND



SPODE - ENGLAND



CHELSEA TEA POT - ENGLAND



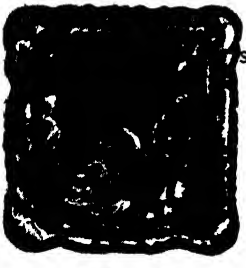
BOWL - AUSTRIA



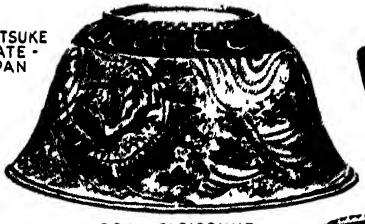
SEVRES EWER - FRANCE



BOWL - PERSIA



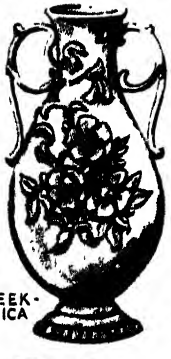
SOMETSUKE PLATE - JAPAN



BOWL CLOISONNE - JAPAN



DELFT BLUE - HOLLAND



BELLEEK - AMERICA



PISA WARE - ITALY



BELLEEK IRELAND



PAPER WEIGHT CHINA



MILK JUG - SPAIN



COFFEE POT - ITALY



JAR - CHINA (MING DYNASTY)



WEDGWOOD EWER - ENGLAND



Photo: U & U

PORCELAIN WARE IN THE MAKING
Girl artists giving objects the final touches of paint and decoration.

POQUELIN, *pok laN'*, JEAN BAPTISTE, the real name of Molière (which see).

PORCELAIN, *pawr' se layn*, or *pawrs' layn*, the name applied to those varieties of pottery that have a glasslike appearance. Porcelain is made from a variety of clay called kaolin and feldspar, or a clay containing a small amount of silica. The processes of manufacture are the same as those employed in making other varieties of pottery. The Chinese invented porcelain, and it is from this fact that porcelain is called *china*, or *chinaware*. They are known to have manufactured it as early as 1000 B.C., and they still continue to make the most delicate and highly prized wares; they are able to produce color effects which Western makers cannot equal.

The manufacture of porcelain was introduced into Europe in 1709, when a factory was established at Dresden by royal decree. This was the beginning of the manufacture of the famous Dresden china.

Classes of porcelain known respectively as hard and soft porcelain are recognized in trade. Soft porcelain is of European manufacture and contains materials that do not enter into the real porcelain, to which the term *hard* applies. Many beautiful articles of soft porcelain are on the market, but they are less delicate than those of hard porcelain. Porcelain is the most expensive pottery made, and choice works command fabulous prices; the ordinary grades, however, are within the reach of those of moderate means, and they make beautiful tableware. See illustration, page 5742.

Sèvres Porcelain. A celebrated grade of hard porcelain has been manufactured at Sèvres, France, for over a century. Rich gilding and enameling and elaborate ornamentation characterize this porcelain. Among the productions are vases five or six feet high, plaques decorated with paintings copied from well known pictures, and figures and groups modeled by eminent sculptors. The town is located seven miles southwest of Paris Its porcelain factory is owned by the government, and there is, besides, a public museum with specimens showing the historic development of the porcelain industry.

Derivation. The word *porcelain* is from the Italian *porcelanna*, meaning *cowrie*; the latter is the name of a shell bearing a close resemblance to the white, glazed surface of this ware.

Related Subjects. The reader is referred in these volumes to the following articles:

Cowrie	Feldspar	Pottery
Dresden China	Kaolin	Silica

PORCUPINE, *pawr' ku pine*, a rodent found in the forests of both hemispheres, whose chief peculiarity is the possession of strong, stiff quills, mixed with the coarse hair



Photos: U & U

Porcelain Ware in the Making. Above, porcelain paste being squared and cut into handy packets. Below, a piece of porcelain in process of becoming a beautiful vase. See PORCELAIN, page 5741.

on the back and sides. The name *porcupine* comes from the French for *spiny pig*. The quills are really slender bunches of hair solidly grown together. They are the animal's principal means of defense, for, unlike squirrels, rabbits, rats, and other rodents, porcupines are slow-moving and dull-witted. Ordinarily, the quills lie down smoothly, but when the animal is excited, they stand sharply erect. That porcupines shoot their quills at their enemies is merely a legend, originating in the fact that the spines come out easily when touched. As these spines are fitted with numerous small barbs that pull them deeper and deeper into the flesh, a combat with a porcupine is a painful and often a dangerous procedure, and many an unwary hunting dog has retired from what seemed an easy conquest with his point of view entirely changed. The tail, too, is a weapon of defense, capable of giving painful blows.

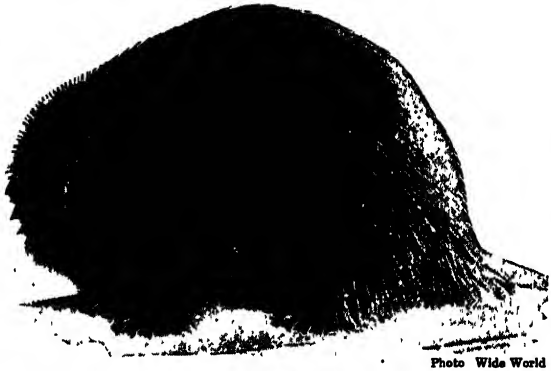


Photo Wide World

THE PORCUPINE

There are two main divisions of the porcupine family, inhabiting the forests of the New World and the Old World, respectively. The latter live in burrows in the ground. Of the American porcupines, the most common is a species found in the forests of Canada and of Northeastern United States. It is about three feet long, including the six-inch tail, and has yellowish-white spines from two to three inches in length, some of them tipped with black. These quills, mingling with the black hair, give the appearance of a black and white coat. This porcupine makes its home in a hollow log or crevice in the rocks, but during the day it usually is found in the trees, where it feeds on the bark, twigs, buds, and leaves. Because of its fondness for bark, it has the bad habit of girdling the main part of a tree, and is sometimes responsible for killing one. Its flesh is good to eat, and men lost in the northern woods rely on the slow-witted creature for food, since it is easily caught and killed.



Photo Visual Education Service

SECTION OF QUILL

A porcupine quill, cut transversely, and magnified about twelve times.

In America the porcupine is sometimes called *hedgehog*, but this name belongs properly to an animal found only in the Old World. It is similar to the porcupine in appearance, but belongs to a different order. See HEDGEHOG. W.N.H.

Scientific Names. The porcupines of the Old World constitute the family *Hystricidae*; those of the New World, the family *Erethizontidae*. The common species of the United States and Canada is *Erethizon dorsatus*; the European porcupine is scientifically denominated *Hystrix cristata*.

PORCUPINE GRASS. See AUSTRALIA (Plant Life).

PORCUPINE MOUNTAINS. See MICHIGAN (Physical Features).

PORCUPINE RESERVE. See MANITOBA.

PORCUPINE RIVER. See YUKON RIVER.

PORIFERA, *po rif' ur ah*, the "pore-bearers," a major division, or phylum, of the animal kingdom, constituting the lowest group of many-celled animals. This division is made up wholly of the sponges. Their habits, structure, and uses are treated in detail under the title SPONGE. See, also, ZOÒLOGY (Divisions of the Animal World). S.H.S.

PORK, the flesh of swine, used extensively as a food. The different portions of the animal's carcass furnish varieties of meat which have special names. The flesh along the backbone (the chine) and on the ribs, corresponding to the loin in lamb and veal, is used for roasts, steaks, and chops. Hams come from the thigh; the flesh on the shoulders is also prepared in the same manner as ham. The flank, directly below the ribs, furnishes bacon. A superior grade of fat for salting is cut from the back, on each side of the backbone. The hocks, directly above the feet, are corned, that is, cured by salting, and are a much-enjoyed German food.

The trimmings of both the lean and the fat meat are used in making sausage. A delicacy known as pickled pigs' feet is prepared by boiling the feet of the pig and covering them with white-wine vinegar. Young, tender pigs are often roasted whole, their flesh being sweet, juicy, and savory. Charles Lamb delightfully makes use of this fact in his *Dissertation on Roast Pig*.

Pork as Food. Pork contains a larger percentage of fat than any other meat, and is therefore a superior fuel food. Fat salt pork has a fuel value of 3,555 calories per pound; the value of medium pork chops is 1,530 calories. Pork is thus an excellent food for cold weather, but should be eaten sparingly in summer. It lends itself to curing much more satisfactorily than either beef or mutton, and its flavor grows richer and more delicate with the passage of time. Cured pork products are therefore among the most useful of meat foods.



COMPOSITION OF PORK CHOPS MEDIUM

The dishes prepared from pork are almost beyond number, for there seems to be no end to the ways in which it can be cooked or combined with other foods. The United States Department of Agriculture especially recommends as savory and palatable dishes the old-fashioned salt-pork milk gravy, and cowpeas baked with salt pork or bacon in the same manner as pork and beans.

Objections to Pork. Because of the indiscriminate and unlimited appetite of the swine, the eating of pork has, in the past, been subject to severe criticism. On the other hand, the careless, unsanitary methods of feeding that formerly prevailed are being replaced by wholesome and scientific methods. The best modern breeders are as careful about the hog, with respect to diet, as they are with any other stock. The flesh of a hog which has been bred in a cleanly manner is as wholesome as beef or mutton. However, pork should never be eaten without being thoroughly cooked, because the hog is sometimes the host of the parasite trichina (which see), and precaution is therefore the wisest course.

In Bible times the swine was regarded as an unclean animal, and the eating of its flesh was forbidden by the Mosaic law. This prejudice was not confined to the Jews alone, however, as the Arabians, Egyptians, and other Oriental peoples had similar beliefs on the subject. E.V.M'C.

Related Subjects. The reader is referred in these volumes to the following articles:

Bacon	Hog
Calorie	Meat and Meat Packing
Cookery	Sausage
Food	Vitamins
Ham	

POROSITY, *po ros' ih tie.* If you pour water into a flask until its level is up to a certain mark on the glass, and then, very slowly, sift fine salt into the water, you will find that you can add a considerable amount of salt before the water level rises appreciably. Also, if alcohol is poured into a flask containing water, the final volume of liquid is less than the original volumes. These experiments illustrate a general property of matter—*porosity*—the property of having pores. All matter, regardless of its structure, has spaces between its molecules. In the first experiment, salt particles filled the spaces between the particles of water; and in the second, some of the water molecules slipped into the spaces between the alcohol molecules. Even the most solid-appearing substances are somewhat porous; by hydrostatic pressure, water can be forced into the thick metal of a cannon until it runs out in tiny streams. See MATTER. A.L.F.

PORPHYRY, *pawr' fih rie.* The name porphyry, or rather porphyrites, means *purple*, and was given by the ancients to a certain rock from Jebel Dhokan, in Egypt, which was much esteemed as an ornamental stone. This rock had a very characteristic appearance, owing to the inclusion of many small white crystals in a dense reddish ground mass. Later, the name porphyry was applied by geologists to all rocks, regardless of color, which contained larger crystals of some mineral scattered through a fine-grained ground mass. There are many kinds of porphyry, but all of them are igneous rocks (which see); some form dikes and some were poured out upon the surface of the earth as lava. The material is sometimes used in road-making. A.J.

PORPOISE, *pawr' pus*, a sea mammal belonging to the same order as the dolphins and the whales (see CETACEA). The best-known



THE PORPOISE

species is the common porpoise of the northern hemisphere. It is from six to eight feet long, and is covered with a smooth, hairless skin, black on the upper part of the body, and white below. It has a short, beakless muzzle, and a blowhole placed between its eyes; its jaws are provided with from forty to fifty teeth each. This porpoise is a relentless hunter of

herring, mackerel, and salmon, and to capture the latter it will venture into rivers, where it frequently falls a prey to fishermen. Porpoises swim high in the water, and a school of them, with their shiny backs visible above the waves, is an interesting sight. Porpoise flesh is not popular as food, but a fatty layer beneath the skin yields an oil of commercial value. A good quality of leather is obtained by cutting down the thick skin of the animal. Sailors often make no distinction between dolphins and porpoises, but the latter lack the beaklike snout of the true dolphin, and frequent bays and estuaries rather than the open sea. See DOLPHIN. L.H.

Scientific Name. Porpoises belong to the family *Delphinidae*. The common species is *Phocaena phocaena*.

PORTA, DELLA. See STEAM ENGINE.

PORTAL CIRCULATION. See BLOOD (Circulation of the Blood).

PORTAL VEIN. See LIVER; BLOOD (Circulation of the Blood).

PORT ARTHUR, an important city and naval station in Manchuria (which see).

PORT ARTHUR, ONT., a city in the Thunder Bay district. It is situated at the head of Lake Superior; with its neighbor, Fort William, it divides the Canadian water traffic between Great Lakes ports and the West. It is also an important railway center, being a divisional point on the main lines of the Canadian Pacific and the Canadian National railways. By rail it is 872 miles northwest of Toronto, 988 miles northwest of Montreal, and 423 miles east of Winnipeg. Duluth is about 180 miles directly southwest of Port Arthur. Population, 1921, 14,886.

Its location, together with its excellent facilities for shipment by rail and water, has made Port Arthur a great collecting and distributing point, especially for the grain-growing Canadian Northwest. Over 370,000,000 bushels of grain in some years pass through the ports of Fort William and Port Arthur. The grain elevator of the Canadian National Railways, with a capacity of 10,000,000 bushels, is said to be the largest elevator in the world. There is also a large Dominion government elevator, one of the system of interior storage elevators.

In addition to its grain interests, Port Arthur receives and ships vast quantities of coal, iron ore, paper, and pulp. The blast furnaces, a dry dock and shipbuilding plant, sawmills, foundries, and coal and ore docks are among the large establishments.

Port Arthur was founded in 1888. It was first known as Prince Arthur's Landing, in honor of Prince Arthur, Duke of Connaught, who was later Governor-General of the Dominion. Since its incorporation as a city, in 1907, it has been known as Port Arthur.

PORT ARTHUR, SIEGE OF. See RUSSO-JAPANESE WAR.

PORT ARTHUR, TEX. See TEXAS (back of map).

PORT-AU-PRINCE, *por toh praNs'*. See HAITI (The Cities).

PORT CHESTER, N. Y. See NEW YORK (back of map).

PORTCULLIS, *port kul' is*. See CASTLE.

PORT DARWIN, a town in Northern Australia. See NORTHERN TERRITORY; NORTH AUSTRALIA.

PORT ELIZABETH, a town and seaport in South Africa, in the Cape of Good Hope Province of the Union of South Africa, ranking next in importance to Cape Town, the capital. It is situated on Algoa Bay (discovered by Diaz in 1488), about 435 miles directly east of Cape Town and about 380 miles southwest of Durban, on slopes and tops of hills which rise about 200 feet above the sea. As a commercial center it is of great importance, and has earned the name of the "Liverpool of South Africa." The residential district is known as "The Hill." Here there is a fine monument to Sir Rufane Donkin, who established the town and whose wife Elizabeth gave it her name. One of the most notable buildings in the city is the Feather Market Hall, where annual sales of ostrich feathers are held. The white population is about 27,000.

PORTER. See BEER.

PORTER, the family name of two men, father and son, whose careers added luster to the annals of the American navy. The son and an adopted son (Farragut) became the first two American admirals.

David Porter (1780-1843) was the first of the two. He was born in Boston, his father being a naval officer in the American Revolution. David served for a time on merchantmen, and was twice captured by the English In 1798 he joined the American navy as midshipman. The next year, as lieutenant, he served on the *Constellation*, then went to Tripoli on the *Philadelphia*, and was taken prisoner (see BARBARY STATES). He remained in captivity until 1805



DAVID PORTER

At the beginning of the War of 1812, Porter was given command of the *Essex*, with it he captured several English prizes, and the next year was commissioned to harass English whaling vessels in the Pacific Ocean. On this cruise he was accompanied by David G. Farragut (which see), whom he had adopted, and who afterward became

an admiral. Just after starting, the *Essex* captured two British vessels, and in three weeks nine prizes were taken, which were sailed into Valparaiso, Chile, for safety.

Later, encountering the English ships *Cherub* and *Phoebe*, the *Essex* was forced into an unequal combat in really neutral waters, and was compelled to surrender; nevertheless, Porter was received with great enthusiasm on his return. He was then made a commodore and put in charge of an expedition against pirates in the West Indies. At Foxardo there was some trouble, and Porter made the Spanish apologize for insulting the American flag. He was then charged with exceeding his authority and was suspended for six months. Incensed at this decision, Porter resigned in 1826, publishing a defense of his action, and enlisted as rear admiral in the Mexican navy, remaining there until 1829. President Jackson then appointed him consul-general to Barbary. In 1831 Porter was made *chargé d'affaires* at Constantinople. In 1841 he became minister there, and died in office.

David Dixon Porter (1813-1891). During the War of Secession, this son of Commodore David Porter was four times voted the thanks of Congress for distinguished service, and was the second man to hold the rank of admiral in the United States navy, the first being Farragut, his brother by adoption Porter was born in Chester, Pa , and when only eleven years old accompanied his father on a cruise against pirates in the West Indies Later, he served as midshipman in the Mexican navy, while his father was in the service of that country. Under his cousin, Captain David H. Porter, he fought in a fierce battle with a Spanish vessel off the coast of Cuba, and was captured. Joining the United States navy as midshipman after his release, in 1829, Porter rose to the rank of lieutenant, and after a varied career which included a secret diplomatic mission to Haiti, he was given command of the *Spitfire* in the Mexican War.



DAVID D PORTER
The second man to become admiral of the United States navy.

When the War of Secession broke out, he served on the *Powhatan* at Fort Pickens, and soon rose to the rank of commander. In the Mississippi River campaign, Porter was offered the command of the Gulf blockading squadron, but declined in favor of Farragut. In the bombardment of Forts Jackson and Saint Philip, in which he was second in command, he fired 16,000 shells, making it possible for Farragut to take his ships past the forts and attack New Orleans. Four days later, Porter captured the forts, and then served between New Orleans and Vicksburg. In 1862, as acting rear admiral, he took charge of the Mississippi squadron, and in the siege of Vicksburg shared the honors of victory with Grant. The rank of rear admiral was then conferred on him.

As commander of the North Atlantic blockading squadron, Porter coöperated so admirably in the attack on Fort Fisher (1865) that he was thanked by Congress and the President. The next four years he was superintendent of the Naval Academy at Annapolis, where he instituted many improvements. In 1866 he was promoted to be vice admiral, and at Farragut's death, in 1870, succeeded him in the highest naval rank in America Not until 1899, when Dewey was awarded the title, did any naval officer hold the rank after Porter's death. See ADMIRAL.

PORTER, GENE STRATTON (1868-1924), a popular American writer, famous for the stories which she called "nature studies, sugar-coated with fiction." In all of these there is a background of outdoor life, for she made her home in the country, where she could study the birds, moths, and plants. In thus writing she made a distinct contribution to nature study, and she illustrated many of her stories and articles with her own drawings and photographic studies. Mrs. Porter, who was the wife of Charles Darwin Porter, was born at Hopewell Farm, Wabash County, Ind. Her first professional work consisted of photographic studies of natural-history subjects, which she contributed to *Recreation*. She was given charge of the "Camera Department" of that magazine, later became a member of the natural-history staff of *Outing*, and still later was associated with the *Photographic Times Annual Almanac*.



Photo Brown Bros
GENE STRATTON PORTER

Her Books. Mrs Porter's first stories were magazine contributions, their success prophesying the wide popularity of her novels Her second novel, *A Girl of the Limberlost*, was translated into Arabic to be used in the introduction of American methods of nature study into the College of Cairo, Egypt Other well-known stories include *Freckles*, *The Harvester*, *Laddie*, *Michael O'Halloran*, *Her Father's Daughter*, *The White Flag*, and *The Keeper of the Bees*. The latter was published posthumously; she was killed in an automobile accident at the height of her career. She also wrote several volumes of natural history and a book of verse.

PORTER, JANE (1776-1850), an English novelist whose fame rests on her historical romances. She was born at Durham and educated in Edinburgh. In her girlhood she came under the influence of Sir Walter Scott, who stirred her imagination with vivid tales of early Scottish history. She is considered the best of the contemporaries of Scott in the field of the historical novel.

Important Writings. Miss Porter's first book, *Thaddeus of Warsaw*, won her great renown on its

publication in 1803, and her popularity was increased in 1810 by *The Scottish Chiefs*, a tale of the heroic Wallace. Her story entitled *Sir Edward Seaward's Diary*, which graphically describes the incidents of a shipwreck, was accepted by many as actual history.



Photo Brown Bros.

JANE PORTER

Miss Porter also wrote *Tales Round a Winter Hearth* in association with her sister, Anna Maria Porter, besides dramatic and periodical literature.

PORTER, WILLIAM SYDNEY (1867-1910), an American author of short stories, best known to the reading public as O. HENRY. It was under this name that he wrote the humorous and realistic tales of the lives of everyday Americans so widely read and loved. Mark Twain was a world humorist, but Porter was essentially American. His clever use of the common street slang of the American city, his broad sympathy, and his keen insight into the lives of the poor are best appreciated by American readers.

"O. Henry" was born in Greensboro, N. C. As a boy he attended school and worked on a ranch in Texas. He began his literary career as a reporter on the staff of the Houston *Post*, where his originality and wit quickly won recognition. He then bought a paper known as the *Iconoclast*, which he published and edited as *The Rolling Stone*, but was not successful in this venture. Then followed a visit to the fascinating land of Central America, where he "knocked around," as he expressed it, long enough to imbibe a good deal of local color to be used later so effectively in the "O. Henry" tales. After his return to America, he worked for a brief period in a Texas drug store (the source of more local color), and then moved to New Orleans to work seriously as a writer of short stories for the daily papers. Finally he settled down in New York, where he did his finest work. In that city he died, a comparatively young man with a most promising future before him.



Photo: U & U

WILLIAM SYDNEY PORTER
"O. Henry"

In all "O. Henry" wrote about 200 short stories now collected under various titles. Among the best of these collections are *The Four Million*, *The Trimmed Lamp*, *The Voice of the City*, *Cabbages and Kings*, *Options*, and *Waifs and Strays*.

PORTES GIL, *porta' heel*, EMILIO, a President of Mexico. See MEXICO (History).

PORT HURON, MICH. See MICHIGAN (back of map).

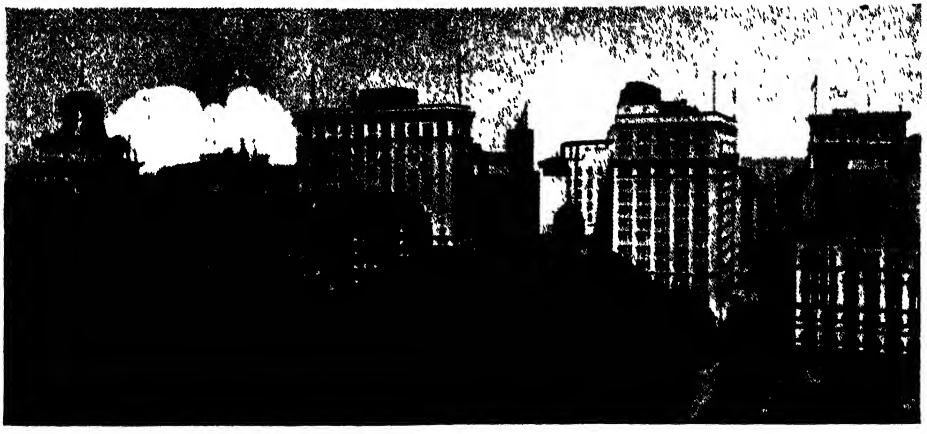
PORT IBRAHIM, *ib rah heem'*. See EGYPT (Modern Cities: Suez).

PORT JERVIS, N. Y. See NEW YORK (back of map).

PORTLAND, ME., a seaport on Casco Bay, and the county seat of Cumberland County, is the largest city in the state and the leading industrial center. Portland is situated on the southwest coast of the state, sixty miles southwest of Augusta, the state capital. Population, 78,600 (Federal estimate).

General Description. Built on a peninsula less than a mile in width and rising to a height of 175 feet above sea level, Portland overlooks Casco Bay with its 200 green islands. To the south is Old Orchard Beach, with its great stretch of sand now famous as the "take-off" for trans-Atlantic flyers. Mount Washington towers above the Presidential Range to the north of Portland, and between is a network of blue lakes and green valleys. Portland is in the center of this natural beauty. Two promenades, built on great promontories at its eastern and western ends, afford splendid views—one of Casco Bay and the broad expanse of the Atlantic, and the other of the great sweep of inland country to the White Mountains.

Lincoln Park, laid out in 1866 after the devastating fire of that year, is the most beautiful of the three parks. It is a civic center, for the city, county, and Federal buildings surround it. Baxter Boulevard forms a parkway around Back Bay, from which there is a splendid view of the skyline. The home of Henry Wadsworth Longfellow has much interest for the visitor. Portland was the birth-



THE BUSINESS SECTION OF OREGON'S LARGEST CITY

place of the beloved children's poet, and there are many relics of the historic past in his home and in the Maine Library and Museum, which adjoins it. The city hall, a magnificent structure of Maine granite, contains one of the largest organs in the world, the gift of Cyrus H. K. Curtis, Philadelphia publisher, who was born in Portland. Other public buildings and institutions include Westbrook Seminary, Portland Society of Arts in the Sweat Memorial Building, the United States Marine Hospital, the Maine General Hospital, the Maine Eye and Ear Infirmary, and the Children's Hospital.

Transportation. Portland has the most easterly harbor in the United States suitable for a port of entry, and is the nearest American port to Europe. It is three and one-half miles from open sea by a straight, clear, natural channel of from thirty-five to fifty feet in depth. Statistics show that Portland is one of the eight principal ports on the Atlantic coast, with an average annual tonnage of 3,000,000. Steamers operate between Portland and foreign ports, and regular service is maintained between Portland and Boston, New York, and Pacific-coast cities.

Three railroads, the Maine Central, Boston & Maine, and Grand Trunk (Canadian National) are connected by the Portland Terminal Company, a belt-line railroad, so that it is possible to receive freight and express to and from all parts of the United States and Canada. The Grand Trunk system maintains two immense grain elevators, with a combined capacity of 2,500,000 bushels. In the winter, when the Great Lakes and Saint Lawrence are not navigable, the port is used for the export traffic of the Grand Trunk System.

Portland is the center of excellent automobile highways, which are extensively used for motor trips to the beautiful surrounding country.

An airport about six miles from the center of the city is equipped to accommodate all types of air transportation.

Commerce and Industry. Approximately 400,000 people shop in Portland. This large interurban and suburban population supports both retail and wholesale distribution, and makes Portland the commercial center of Northern New England.

Although Portland has more than 200 manufacturing plants, the city has a small foreign population. Good wages and living conditions have made labor troubles practically unknown. The principal exports are grain, lumber, cooperage products, and apples.

History. Portland was founded in 1632 by two Englishmen, George Cleves and Richard Tucker. The early Indian name was Machigonne, but the place after settlement was known as Casco Neck and later as Falmouth. On the city seal is the inscription *Resurgam* (I shall rise again). It is significant of the four times when Portland suffered all but complete destruction. In 1676 and 1690 the place was demolished by Indians. In 1775 it was bombarded by the British, and in 1866 it suffered a loss of $10,000,000 by fire. Noted citizens of Portland include Commodore Preble, Neal Dow, Thomas B. Reed, Robert E. Peary, and Donald B. MacMillan. H.H.W.

PORTLAND, ORE., the largest city of the state and the county seat of Multnomah County, situated fifty miles north of Salem, the state capital, and 183 miles south of Seattle. The city is an important seaport, as the broad Columbia and Willamette rivers bear its ocean-going craft to and from the Pacific Ocean, 100 miles to the west. Population, 1925, 282,380 (Federal estimate).

General Description. Portland, known as "The City of Roses," occupies a site of land which slopes gradually from both banks of the Willamette, which is spanned by four steel and three concrete bridges. Graceful Mount Hood, with its snowy peak; Mount Jefferson; and Mount Adams, covered with forests of firs, cedars, and oaks, overlook the city. The vicinity is noted for beautiful waterfalls, and the city marks the end of the famous old Oregon Trail, now the scenic Columbia River

Highway (which see). The park system includes 2,000 acres, of which Peninsula Park, with its hundreds of varieties of roses and its sunken gardens, is the most famous. The fine statues of *Sacagawea* (see LEWIS AND CLARK EXPEDITION) and *The Coming of the White Man* stand in Washington Park. Hedges of roses, which bloom in winter, line the streets of Portland, and its Rose Festival is a beautiful annual pageant. Portland is noted for its fine residences, and has over 700 miles of well-kept streets and boulevards.

Transportation. Portland is the terminus of four great transcontinental railroads, the Great Northern, the Northern Pacific, the Southern Pacific, and the Union Pacific. There is an excellent harbor, and over fifty steamship lines radiate to all the important ports of the world. River boats also sail to ports of both the Willamette and Columbia rivers, going as far east as Lewiston, Ida.

Industries. Portland is one of the largest lumber-shipping ports in the country, and millions of feet of lumber are consumed in the manufacture of pulp for the use of paper mills. Other outbound shipments include flour, apples, prunes, canned goods, furniture, salmon, wool, hops, and wheat, as the area drained by the Columbia River is one of the world's richest agricultural sections.

In output of manufactures, Portland ranks among the chief cities of the Pacific states; these include machinery, clothing, and ready-cut houses; in all, the city has over 1,100 industrial plants, and its mills line the Willamette Hydroelectric power for manufacture is derived from the Willamette Falls at Oregon City, twelve miles southeast of Portland.

Education. The city is the seat of Reed College, the University of Oregon Medical School, and the North Pacific College of Dentistry and Pharmacy.

History. In 1843 the site of Portland was a mere boat landing. Two of its earliest settlers, by name Lovejoy and Pettygrove, the first from Massachusetts and the other from Maine, determined the name of the new settlement by the toss of a coin; Pettygrove, winning, decided upon Portland, after the city in Maine. After 1850 the growth of the place was rapid; and in 1851 it received a city charter. A great fire occurred in 1873, and in 1894 much damage was caused by floods. The Lewis and Clark Centennial Exposition was held in the city in 1905. The commission plan of government was adopted in 1913, and a housing scheme in 1919. Annexations of territory have increased the area of the city to sixty-three square miles. H.C.

PORTLAND CEMENT. See CEMENT; CONCRETE.

PORTLAND VASE, a transparent, dark-blue cinerary urn, coated with opaque white glass cut in cameo style. It was found in a tomb, supposed to be that of Alexander Severus, near Rome, in the seventeenth century, and was purchased by Sir William Hamilton in 1770 for 1,000 guineas. Later, the vase came into the possession of the Duke of Portland, who placed it in the British Museum. It was dashed to pieces by a lunatic in 1845, but was skilfully repaired.



Photo: Visual Education Service

THE MAGNIFICENT PORTLAND VASE

One of the choicest pieces of pottery ever made, now treasured in the British Museum.

PORT NATAL, *nah tahl'*. See DURBAN.

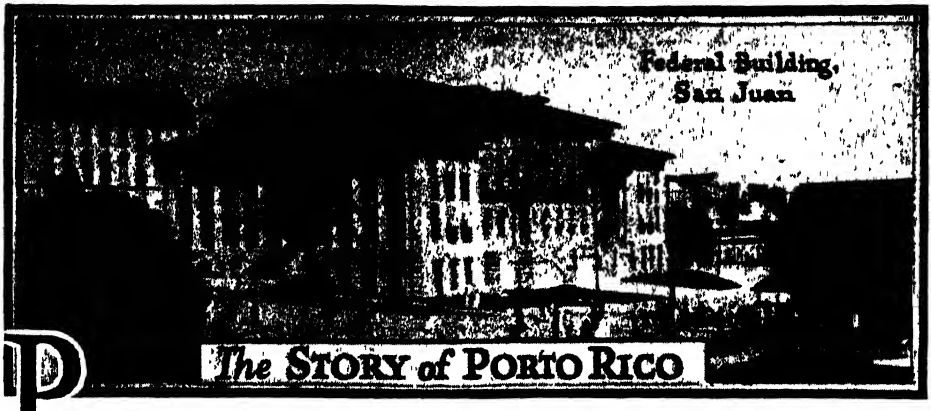
PORT NELSON. See HUDSON BAY.

PORTO ALEGRE, *pohr' toh ah la' greh*. See BRAZIL (The Cities).

PORT OF ENTRY. The officers of a vessel bringing merchandise from a foreign country may not put in to any port they choose and there unload their goods. Governments have designated certain points as *ports of entry*, and at these only may foreign goods be unloaded and released to domestic trade. At each of these ports of entry, a customhouse has been established, through which all imports must pass, and the officers of any vessel putting in at a port without a customhouse and there unloading imports are guilty of smuggling. Since shipping in bond has obtained so widely, ports of entry are not necessarily seaports; inland cities may hold bonded goods in their customhouses. See BOND (Other Meanings of the Word).

PORT OF SPAIN. See TRINIDAD.

PORTO GRANDE, *grahn' day*. See CAPE VERDE ISLANDS.



The STORY of PORTO RICO

PORTO RICO, *pohr' toh re' ko* (Spanish spelling PUERTO RICO, meaning *rich port*), a beautiful and productive island of the West Indies, which became a possession of the United States in 1898, at the conclusion of the Spanish-American War. Nineteen years later (1917), the inhabitants were granted the status of citizens.

The island lies about 1,000 miles southeast of Key West, Fla., and eighty miles directly east of the island of Haiti. Among the Greater Antilles—Cuba, Jamaica, Haiti, and Porto Rico—it ranks fourth in size, but, with more than 370 persons to the square mile, is the most densely populated of the four. Having the general shape of a parallelogram, Porto Rico is about 100 miles from east to west and 35 miles from north to south; its area of 3,435 square miles is about one-third less than that of the state of Connecticut. If a few small islands along the coast, belonging to it geographically, are considered, the area is 3,606 square miles. No point on Porto Rico is more than eighteen miles from the sea, and the port of San Juan is only ninety-six hours from New York.

Though a tropical island, Porto Rico has but one type of snake, the python; there are no alligators or crocodiles. Bathing is not safe in all places, because of the barracuda (which see).

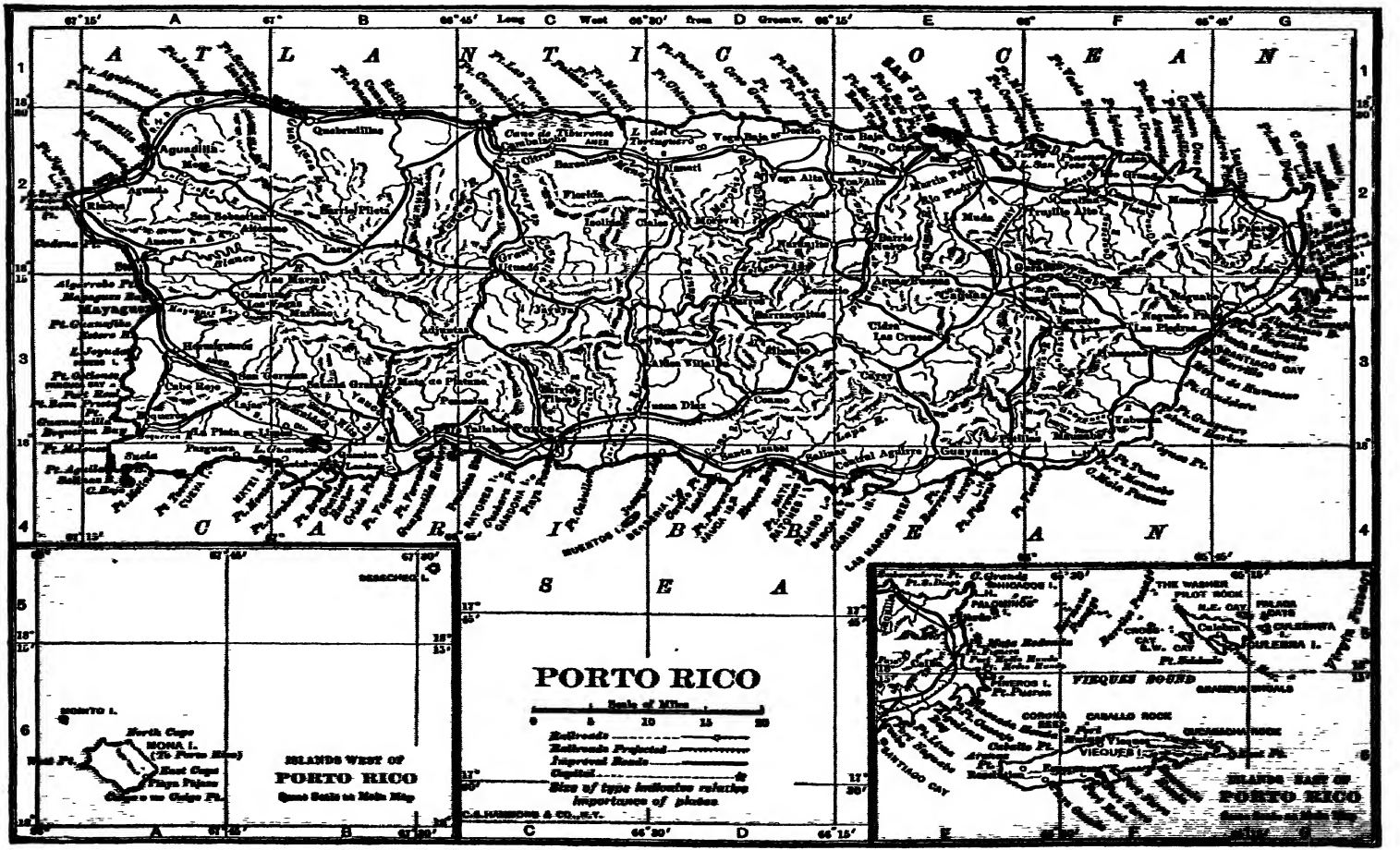
The People. About one-third of the inhabitants are negroes and people of mixed negro and Spanish blood, the descendants of the Africans who were brought to the island as slaves. The majority of the two-thirds who are whites are Spanish, but many American and European business men have acquired interests in the sugar and tobacco industries; the population has been also increased by not a little immigration. In 1920 the island had a population of 1,299,800. According to an estimate of the United States Census Bureau, it had increased to 1,456,000 in 1928, about 400 to each square mile.

When the American nation acquired Porto Rico, about ninety per cent of the people suffered from hookworm disease; under the ministration of Dr. Ashford of the United States army, the ailment was practically eradicated. More than sixty-three per cent of the natives are engaged in agricultural pursuits and in fishing; about twenty-one per cent are in domestic and personal service; eight per cent are in manufacturing; and eight per cent in trade.

The Cities. The metropolis of Porto Rico is San Juan, now a city of about 75,000 people. Next in size is Ponce, with a population of over 42,000, followed by Mayagüez, Caguas, and Arecibo, ranging in population from 20,000 to 10,000.

San Juan, *hwahn*, the capital and chief seaport, is situated on a coral islet off the northern coast of the main island, the two being connected by the Bridge of San Antonio and a causeway. Picturesque walls, 250 years old, surround the older part of the city, Morro Castle, built in 1584, occupies a promontory on the western end San Juan was the seat of the Spanish provincial government. It is the only fortified city on the island, and it has on many occasions withstood the attacks of English fleets, as well as a bombardment by Americans (see below under *History*) The town is attractively laid out and has several notable buildings and ecclesiastical edifices. Sanitation has been thoroughly instituted since American occupation. The city is an important center of tobacco manufacture.

Ponce, founded in 1752 and named in honor of Ponce de Leon, is on the south coast. The Portuguese River divides it into two parts—Ponce, the city proper, and Ponce Playa, the seaport. Ponce Playa is on a spacious bay, and Ponce lies two miles inland on a beautiful plain with rolling hills as a background This quaint city is second in importance, as well as in size. It is a shipping center for sugar and tobacco Sugar and allied products, cigars, cigarettes, and ice are the chief manufactures, and the preparation of coffee for the market is a thriving industry. Paved streets and stuccoed brick or stone houses give the town a well-built appearance, and public squares and attractive public buildings show the civic pride of the people.



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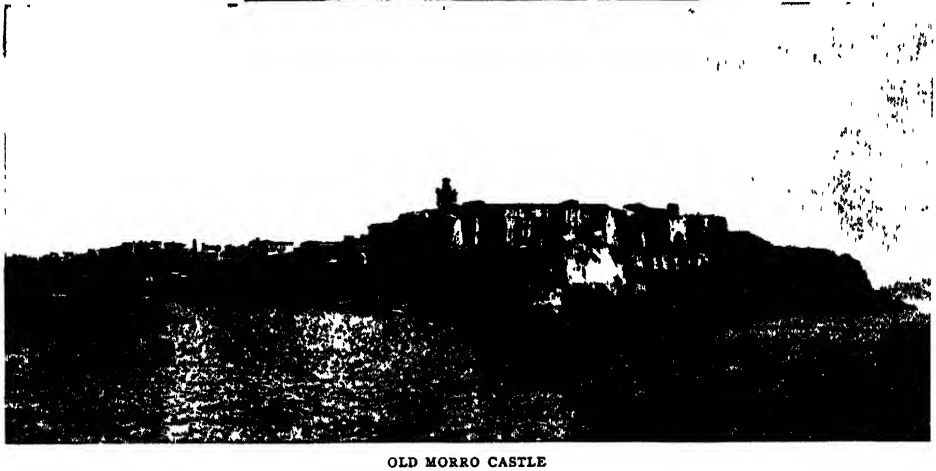
How to Read a Map. See page xvi, facing text page 1

PORTO RICO

Adjuntas, 1,729 ..... B 3
Aguada, 1,078 ..... A 2
Aguada, Point ..... A 2
Aguadilla, 8,035 ..... A 2
Aguadilla Bay ..... A 2
Aguas Buenas, 1,999 ..... E 3
Aguila, Point ..... A 4
Agujereada, Point ..... A 1
Aibonito, 2,281 ..... D 3
Aldea Villalba ..... D 3
Algarrobo Point ..... A 3
Algodones Bay ..... G 3
Altosano ..... A 2
Anasco, 2,552 ..... A 2
Arecibo, 10,039 ..... C 1
Arenas, Point ..... D 4
Arenas Point ..... E 6
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Barca Islands ..... E 4
Barceloneta, 1,316 ..... C 2
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Barranquitas, 896 ..... D 3
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Barrio Nuevo, 1,365 ..... E 2
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Barrio Tibes, 1,957 ..... C 3
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Bauta River ..... D 3
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Bayamon River ..... E 2
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Buena Vista, 1,109 ..... F 2
Caballo Point ..... E 6
Caballo Rock ..... F 6
Cabo Rojo, 4,327 ..... A 3
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Caguas, 12,149 ..... E 3
Caguas Tramway ..... E 2
Caigo o no Caigo Point ..... A 6
Cambalache, 935 ..... C 2
Camuy, 1,630 ..... B 1
Camuy River ..... B 2
Candelero, Point ..... G 3
Candona Island ..... C 4
Cannilla River ..... C 2
Cano de Tiburones ..... C 2
Canovanas, 3,147 ..... F 2
Canovanas River ..... F 2
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Coamo River ..... D 3
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Culebra Island ..... G 5
Culebrinas River ..... A 2
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East Point ..... G 6
El Morrillo ..... G 3
Embarcaderos Point ..... G 2
Ensenada ..... B 4
Ensenada Honda ..... F 6
Ensenada Honda ..... G 3
Ensenada Point ..... A 2
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Espino River ..... F 3
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Fajardo, 6,571 ..... G 2
Fajardo River ..... G 2
Fanduca Cay ..... A 3
Ferro, Port ..... F 6
Figuera, Point ..... G 2
Figuras, Point ..... E 4
Florida ..... C 2
Fraile, Point ..... D 1
Fraternidad ..... B 3
Grampus Shoals ..... G 6
Grande, Cape ..... G 2
Grande de Arecibo River ..... C 2
Grande River ..... F 2
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Guanajibo, Point ..... A 3
Guanaquilla, Point ..... A 3
Guanica, 2,103 ..... B 4
Guanica Harbor ..... B 4
Guanica, Lake ..... B 4
Guayama, 8,924 ..... E 4
Guayanes, Point ..... F 3
Guayanes River ..... F 3
Guayanilla, 1,434 ..... B 3
Guayanilla Harbor ..... B 4
Gurabo, 2,550 ..... F 2
Gurabo River ..... F 3
Hatillo, 724 ..... B 1
Hermanos Passage ..... F 5
Hicacos Island ..... G 2
Hormigueros, 538 ..... A 3
Humacao, 6,183 ..... F 3
Iglesia, Point ..... F 2
Isabela, 1,699 ..... A 1
Isolina ..... C 2
Jacaguas Landing ..... C 4
Jacaguas River ..... C 3
Jacinto, Point ..... A 1
Jauca Island ..... D 4
Jayuya, 1,063 ..... C 3
Jiguero, Point ..... A 2
Jorobado, Point ..... B 4
Joyuda, Lake ..... A 3
Juana Diaz, 2,211 ..... D 3
Juncos, 4,263 ..... F 3
Lajas, 983 ..... A 3
La Muda ..... E 2
Landing ..... B 4
Landing ..... D 4
Lapa River ..... E 3
La Plata or Limon ..... A 3
Lares, 2,693 ..... B 2
Las Cruces ..... E 3
Las Marcas Reef ..... E 4
Las Marias, 531 ..... B 3
Las Piedras, 618 ..... F 3
Las Tunas, Point ..... C 1
Lima, Point ..... G 3
Limon or La Plata ..... A 3
Loiza, 1,077 ..... F 2
Loiza River ..... F 2
Lorenzo River ..... F 3
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Mala Pascua, Cape ..... F 4
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Mameyes ..... F 2
Manati, 6,147 ..... D 2
Manati, Point ..... C 1
Manati River ..... C 2
Maria, Point ..... E 2
Maricao, 740 ..... B 3
Martin Pena ..... E 2
Mata de Platano ..... B 3
Mata Island ..... D 4
Mata Redonda, Point ..... G 2
Matei Island ..... A 4
Maunabo, 908 ..... F 3
Maunabo, Port ..... F 4
Mayaguez, 19,124 ..... A 3
Mayaguez Bay ..... A 3
Mayaguez River ..... A 3
Medio Mundo, Point ..... E 6
Medio Mundo, Port ..... G 2
Melones, Point ..... A 4
Miquillo, Point ..... F 2
Moca, 1,717 ..... A 2
Molino, Point ..... A 4
Mona Island, 35 ..... A 6
Monito Island ..... A 6
Montalva ..... B 4
Montalva, Point ..... A 4
Morovis, 1,218 ..... D 2
Morovis River ..... D 2
Morro de Humacao ..... G 3
Motacana River ..... D 2
Muertos Island ..... C 4
Mulas, Port ..... F 6
Naguabo, 3,651 ..... F 3
Naguabo Playa ..... F 3
Naguabo, Port ..... G 3
Naranjito, 1,223 ..... D 2
North Cape ..... A 6
Northeast Cay ..... F 5
Ostiones, Point ..... A 3
Pajaro Island ..... D 4
Palada Cays ..... G 5
Palmas Altas, Point ..... C 1
Palominos Island ..... G 2
Palo Seco, 797 ..... E 1
Palo Seco Point ..... E 1
Parguera, 661 ..... A 4
Patillas, 1,693 ..... E 3
Penon, Point ..... B 1
Penuelas, 1,343 ..... C 3
Penuelas Station ..... C 4
Petrona, Point ..... D 4
Pilot Rock ..... F 5
Pinero Island ..... A 3
Pineros Island ..... G 2
Pinones, Lake ..... F 2
Plata or Toa River ..... E 3
Playa Grande ..... F 6
Playa Pajaro ..... A 6
Playa Ponce ..... C 4
Ponce, 41,912 ..... C 3
Port Ferro ..... F 6
Port Maunaba ..... F 4
Port Medio Mundo ..... G 2
Port Mulas ..... F 6
Port Naguabo ..... G 3
Port Real ..... F 6
Port Real ..... A 3
Puerca, Point ..... G 3
Puerto Nuevo, Point ..... D 1
Punta Santiago, 1,201 ..... G 3
Quebradillas, 1,420 ..... B 2
Ratones Island ..... D 4
Ratones Island ..... C 4
Real Port ..... A 3
Real, Port ..... F 6
Resolution ..... E 6
Rincon, 514 ..... A 2
Rincon Bay ..... D 4
Rio Grande, 1,962 ..... F 2
Rio Piedras, 5,820 ..... E 2
Rojo, Cape ..... A 4
Sabana Grande, 2,856 ..... B 3
Salinas, 1,385 ..... D 4
Salinas Bay ..... A 4
Salinas, Point ..... E 1
San Augustin, Point ..... F 2
San Diego, Point ..... G 2
San Francisco, Cape ..... A 2
San German, 5,019 ..... A 3
San Jose Lake ..... F 2
San Juan (capital), 71,443 ..... E 1
San Lorenzo, 3,662 ..... F 3
San Sebastian, 2,611 ..... A 2
Santa Isabel, 1,143 ..... D 4
Santa Rita ..... B 3
Santiago Cay ..... G 3
Santurce ..... E 2
Sardina, Point ..... A 1
Soldado, Point ..... F 5
Southwest Cay ..... F 5
Sucia Bay ..... A 4
Tallaboa ..... C 3
Tanama River ..... C 2
Toa Alta, 1,172 ..... E 2
Toa Baja, 1,559 ..... E 2
Toa or Plata River ..... E 2
Tocon, Point ..... A 4
Torre, Lake ..... F 2
Tortuguero, Lake del ..... D 2
Trujillo Alto, 539 ..... F 2
Tuna, Point ..... F 4
Utuado, 3,700 ..... C 2
Uvero, Point ..... F 2
Vacia Talegas, Point ..... F 2
Vaguero, Point ..... B 4
Vega Alta, 2,142 ..... D 2
Vega Baja, 3,607 ..... D 2
Verraco, Point ..... B 4
Viento, Point ..... F 4
Vieques, 3,424 ..... F 6
Vieques Island ..... F 6
Vieques Sound ..... F 6
Virgin Passage ..... G 5
Washer, The ..... F 5
West Point ..... A 6
Yabucoa, 2,888 ..... F 3
Yabucoa Harbor ..... F 3
Yauco, 7,053 ..... B 3
Yeguas Point ..... F 4

Education and Religion. Since 1899 education has made remarkable progress in Porto Rico. It has been made compulsory, and a system of elementary schools on the American plan is in operation. Salaries of teachers are paid from the insular treasury, and they compare favorably with the salaries paid the average teachers in America. More than half of the rural teachers are men, and of about 4,475 teachers employed, all are Porto Rican except approximately 145 from the United States. The hurricane of September, 1928, destroyed many of the school buildings, and about 2,300 schoolrooms out of the previous total of 4,470 were either completely or partially demolished by the wind. However, it is remarkable to note that by December of that year ninety per cent of the schools were again in operation. This very fact testifies to the desire for and appreciation of education on the part of the Porto Ricans The discouragement of seeing more than half the material evidence of the efforts of many years blown away in a few hours did not deter them.





OLD MORRO CASTLE

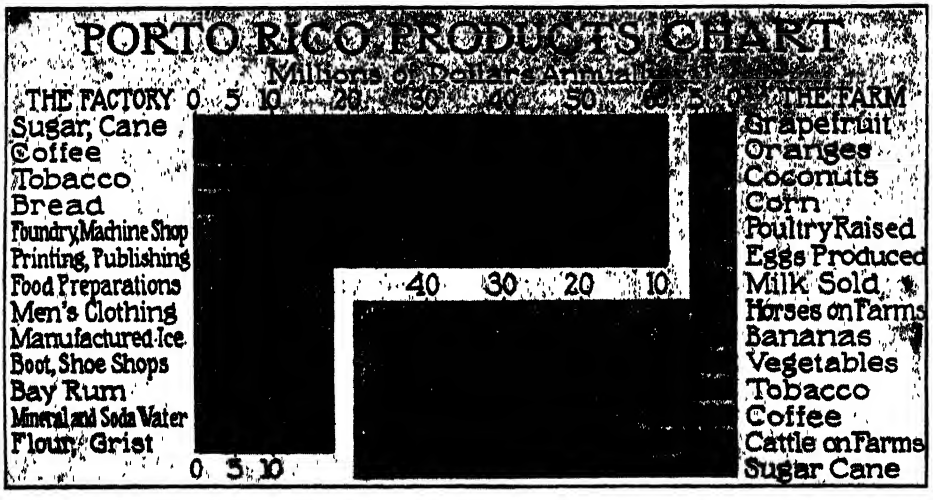
Above, its walls, as seen from within Below, a view of the castle from the water. It was once considered a strong fortress

At the University of Porto Rico, seven miles from San Juan, normal-training courses are given, and there are the usual university departments. This institution has an enrollment of over 3,000 In San Juan there is a $100,000 Carnegie Library. The English language is spoken in the schools, and textbooks in English are used, though Spanish is taught throughout the course. Many of the children of the wealthy class are educated in the United States and in Europe. By the intensive program of education carried on since the United States took control, illiteracy decreased from eighty-five per cent in 1899 to about forty per cent in 1927, and in the same year, 213,321 children were enrolled in the schools.

The majority of the inhabitants are of the Roman Catholic faith.

Physical Characteristics. A range of forest-covered hills, 2,000 to 4,398 feet high, stretches across the island from east to west, and slopes down on both sides to the level lowlands along the north and south coasts. The lowlands are the grazing places of the Porto Rican cattle. The soil is very fertile, and contains a high percentage of lime. In the north the rivers are longer, and many lagoons border the shores, but on the southern coast severe droughts often occur, and artificial irrigation is necessary. Many rapid rivers rising in the interior hilly region furnish water power, and forty-seven of Porto Rico's 1,300 streams are of good size, although not navigable for any distance. The Bayamon, the Loiza, La Plata, the Manati, and the Arecibo, flowing to the northern coast, the Jacaguas in the south, and the Blanco in the east, are among the most important.

Climate. As in most hilly, tropical countries, the temperature varies at different altitudes, but Porto Rico has the most pleasant and healthful climate of any of the West India islands. The intense heat of the lowlands is



Figures represent averages covering a period of four years.

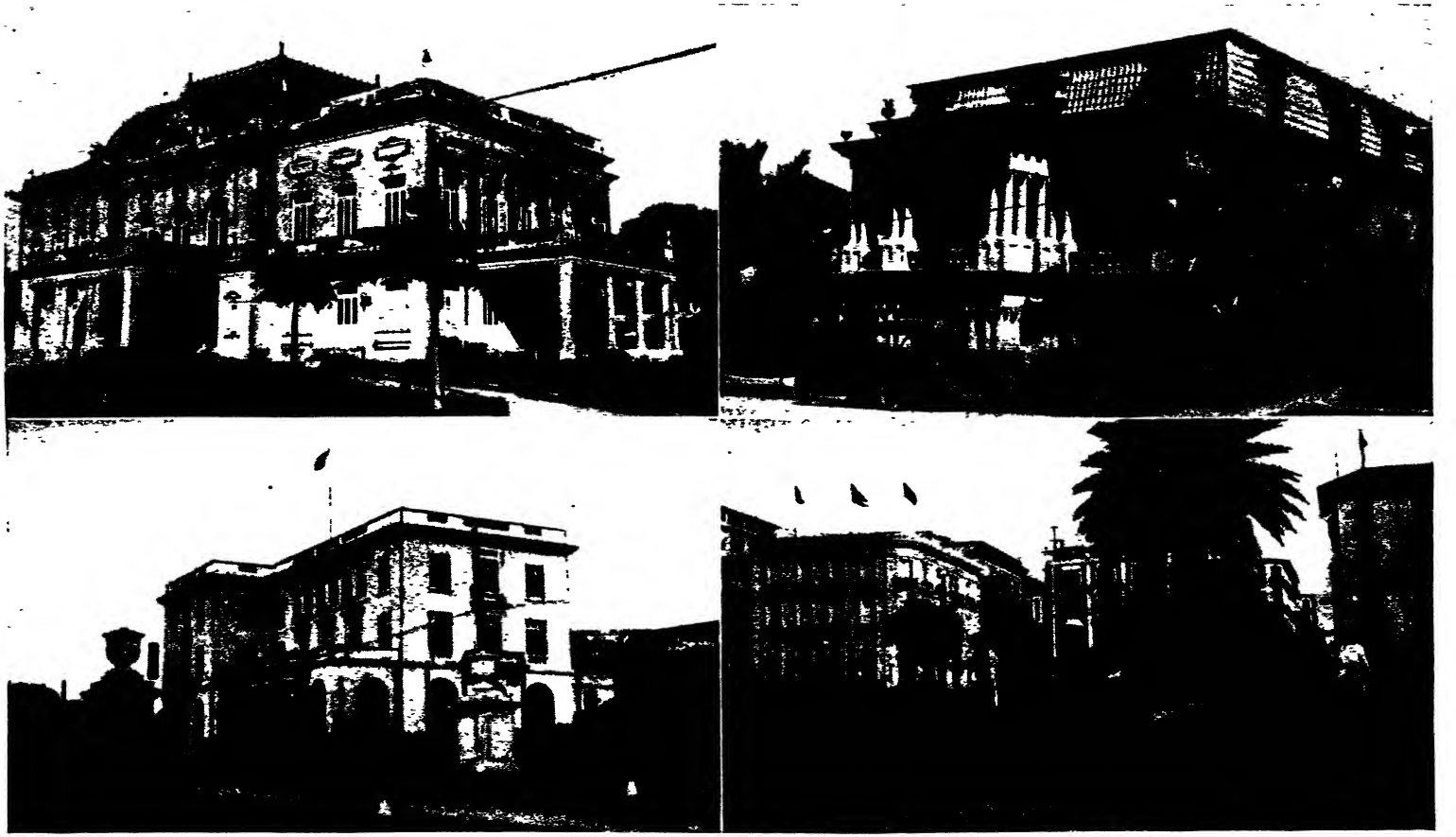
modified by the northeast trade winds, and the nights are generally cool. During the hottest weather the temperature is rarely more than 98° F., and in the highlands during the cold weather the thermometer seldom falls below 60°; frosts or hailstorms, and of course, snow, are unknown in the island. During the so-called "hurricane months"—July, August, and September—the winds are often severe, and severely destructive hurricanes have been the main impediment to agriculture. Those of 1899 and 1928 wrought particular havoc.

Mineral Resources. Practically all of the public buildings are constructed of limestone, which is found abundantly on the island. Many of the homes of the better classes are built of stuccoed limestone, but the majority are built of reinforced concrete. Clay used in making brick and earthenware, marble suitable for bridge piers and other constructional work, flagstone of good quality, and gypsum, employed in the manufacture of stucco and fertilizer, are other products of commercial value. On Mona Island, lying off the western coast, are beds of guano and of phosphate which are being worked. Salt deposits are found at several points on the main island; almost all of this product is derived from sea evaporation. Though Porto Rico contains deposits of gold, silver, iron, copper, tin, mercury, platinum and other materials, the mining industry is still a matter of future enterprise.

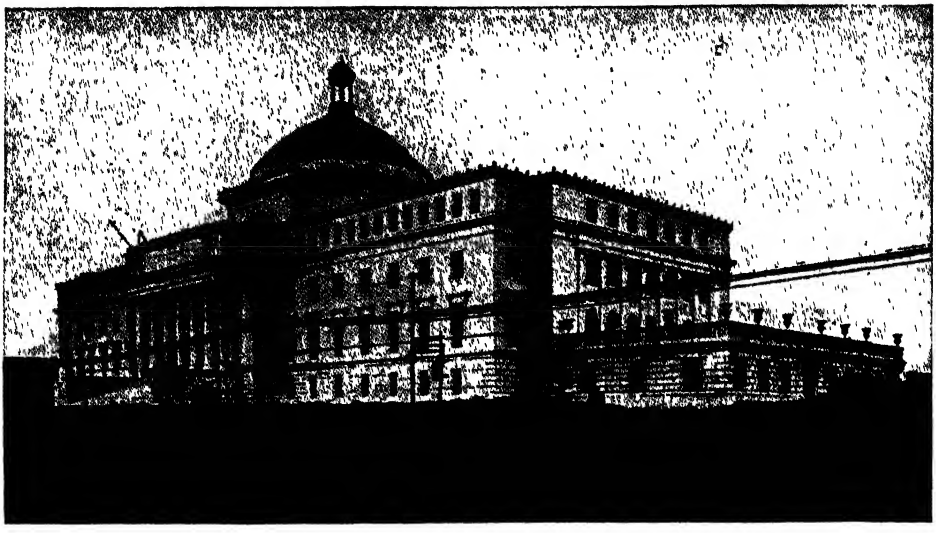
Agriculture. All other industries in Porto Rico are secondary to those connected with the cultivation of the soil. The sugar and tobacco crops lead in amount and value, followed by coffee, which was the original product assigned to Porto Rico by Spain. Though diminishing, it ranks second in the export trade. A new irrigation system has greatly increased the output and export of sugar, and its producers within recent years have enjoyed unusual prosperity. Fruits and vegetables are of growing importance. Among the fruits, bananas, pineapples, plantains, oranges, grapefruit, and coconuts are the most important exports, and among the vegetables, beans. The fruit exports range from $5,500,000 to $6,400,000 in annual value. Ninety-one per cent of Porto Rico's trade is with the United States.

According to the United States Census Bureau, out of a total area of 2,198,400 acres, 2,022,404 acres are in cultivable land; 1,303,547 acres are in improved land; and 41,078 acres are in farm holdings. The problem of the future is the equalization of farm holdings, as too much of the land is devoted to large sugar plantations. As a result, the people must rely for many of the necessities of life on importations, whereas the island should be self-supporting.

Other Industries. The leading manufacturing industries of the island—the making of sugar and molasses, the manufacture of cigars and cigarettes, and the cleaning and polishing of coffee—are directly connected with the chief branches of agriculture. Over 275,000,000 cigars and more than 354,455,000 cigarettes are manufactured a year by the Porto Rican tobacco houses. In 1926 over 214,500,000 cigars alone were exported. San Juan and Ponce are important tobacco centers, and Mayagüez and Caguas, of coffee cleaning and polishing. Minor industries are the manufacture of hats and straw goods and of boots and shoes, and general shop construction and repairing. Business is showing rapid expansion. There are in the island about 650 manufacturing industries, capitalized at $85,000,000.



The Island Is Progressive. San Juan views in the top row are, left to right, the Casino and an apartment house. Below, the Young Men's Christian Association building and a corner in the residential section, on France Avenue.



PORTO RICO'S CAPITOL BUILDING

Meat is so expensive, because it must be imported, that Belgian hares are raised to supply meat for the people.

Transportation and Communication. There are about 1,500 miles of macadamized roads in Porto Rico, and old roads are being improved rapidly as a result of an annual government appropriation for the construction of highways. A railroad line encircling the island, which has long been planned, is almost complete; 335 miles had been finished in 1929. This railroad has several short branches connecting with various centers of industry, and a new line across the island is being projected. The residents of the cities enjoy the convenience of private telephones, and telegraphic communication is enjoyed throughout the island, there being about 1,850 miles of postal telegraph wire. The mail is distributed through ninety-one postoffices. The Postoffice Department of the United States controls the railway mail and postal service.

Government. For about two years following the cession of the island to the United States, Porto Rico was under the jurisdiction of American military governors. The first provision, called the Foraker Act, providing for civil government of the island, was passed by Congress in 1900, and this law, with slight amendments, was in force until 1917.

In 1917 the Congress passed the Jones Act, which gave Porto Ricans full rights as citizens of the United States, though such citizenship was not obligatory, and an unusually large share in the responsibility of government. The former appointive executive council was replaced by a senate composed of nineteen members, chosen by ballot by the people of Porto Rico. The lower branch of the legislative department consists of a house of representatives of thirty-nine members, also elected by the people. The governor, who is appointed by the President, appoints the following heads of executive departments: commissioners of interior, agriculture and labor, health, and the treasurer. The attorney-general, the commissioner of education, and the auditor are appointed by the President. A resident commissioner represents the island in the House of Representatives at Washington. He is elected by the people for a term of four years, and has a voice but no vote in the House. The laws passed by the legislature are subject to the approval of Congress and the President. In 1929 Theodore Roosevelt received appointment as governor of the territory.

History. In 1493 Porto Rico was visited by Columbus, and was named San Juan Bautista. In 1508 Ponce de Leon reached the island, and two years later began its conquest. He founded the town of Caparra, now known as Pueblo Viejo, near the present city of San Juan, which was a settlement nearly sixty years before Saint Augustine, Fla., was founded. Casa Blanca was built 250 years before the White House at Washington was erected. In 1595 San Juan was attacked unsuccessfully by Sir Francis Drake, who was accompanied by Sir John Hawkins in an expedition against the Spaniards in the West Indies. They failed to find the treasure they sought, amounting to $4,000,000, which the Spaniards had removed from their ships in the harbor and had secreted on shore. Both Drake and Hawkins, thus defeated, died at sea soon after. San Juan was sacked by Lord George Cumberland in 1597, but



PRESBYTERIAN HOSPITAL, SAN JUAN

the powerful ports and brave defense of the people repulsed later attacks by the English and the Dutch, in the seventeenth and eighteenth centuries, and the island remained in the possession of Spain. Under the rigorous Spanish rule, the natives were gradually swept away, and negroes were imported from Africa as slaves. In 1820 and again in 1867, the Porto Ricans were unsuccessful in an attempt to declare their independence, and in 1870 the island was made a Spanish province. For eleven years it was allowed representation in the Spanish Parliament, being referred to by the home government as the "ever loyal and faithful isle." In 1873 forced labor was abolished and the last traces of slavery disappeared. Being alarmed by the revolt in Cuba in 1895, Spain instituted a reform in the government of Porto Rico, which was put into effect in 1897, when the people were granted autonomy.

This government seemed to be working successfully when war was declared between Spain and the United States in 1898. Admiral Sampson in May bombarded San Juan, in July Ponce surrendered, and after a campaign which lasted but nineteen days, the American army, in charge of Lieut. General Nelson A. Miles, occupied most of the island. Peace was signed on December 10, 1898, and the island was evacuated by the Spanish and ceded to the United States. In partial return for the cession of Porto Rico and the Philippine Islands, the United States gave Spain $20,000,000. In less than a year, military rule was withdrawn, and civil rule was established.

When the United States took over Porto Rico, there were practically no motor roads and only one railroad, twenty-four miles in length. To-day there are some of the most excellent highways in the world. However, off the main roads there are only rough passageways. The advancement in education has been remarkable.

(In passing, it will be of interest to the reader to know that more than 3,000 sets of THE WORLD BOOK have been sold on this small island.)

Sanitary science has been applied to the island's needs as never before. Only San Juan had a sewerage system in 1899, and few other towns had a water supply. By 1920 practically every town had water and sewerage systems, as well as modern hospitals and efficient medical service. Electricity, street cars, and every kind of public improvement have been installed in San Juan, to make it a modern and up-to-date city.

One of the most striking facts in the economic situation is that the value of exports increased so greatly after 1899 that within twenty years exports exceeded the value of imports. In 1899 the total value of imports from the United States alone was nearly $4,000,000, and that of exports was almost $3,500,000; in 1927 imports from the United States had increased to more than $90,000,000, and exports to over $183,000,000. During the financial depression of 1922, both exports and imports decreased considerably, but soon a gradual increase was again apparent. The total imports and exports of the island are in excess of those of the six states of Central America, which are sixty times larger in area and four times larger in population.

In February, 1928, the political leaders of the island sent a message to President Coolidge through Colonel Charles A. Lindbergh, petitioning that Porto Rico be made a "Free State"—with internal sovereignty, but not international independence. This was followed up by several cablegrams to the President, Charles E. Hughes, and the heads of both houses of Congress. President Coolidge in his reply asserted that greater liberty was then enjoyed by Porto Rico than ever before in its history. The letter brought forth very unfavorable comment in Porto Rico, and no doubt the problem of Porto Rican independence will take its place side by side with that of Philippine independence.

On September 13, 1928, a terrific hurricane struck Porto Rico, leaving 400,000 homeless, killing over 250 people, and crippling the island

Outline and Questions On Porto Rico

I. Position and Size

(1) In West Indies group
(2) Distance from United States
(3) Area
  (a) Actual—3,435 square miles
  (b) Comparative

II. People

(1) Population
(2) Cities
(3) Races
(4) Occupations
(5) Religion
(6) Education

III. Geography of the Island

(1) Central range of hills
(2) Coastal lowlands
(3) Rivers
  (a) Importance of water power
(4) Climate

IV. Resources and Industries

(1) Minerals
(2) Agriculture
  (a) Primary importance
  (b) Chief crops
(3) Manufactures
  (a) Dependence on agriculture

V. Commerce and Transportation

(1) Value of trade
(2) Railroads
(3) Roads

VI. Government and History

(1) Governor appointed by President
(2) Legislative department
(3) History
  (a) Discovery
  (b) Settlement
  (c) Spanish rule
  (d) Spanish-American War and American dominion

Questions

What do the public buildings of Porto Rico indicate as to the mineral resources of the island?

Show that the manufactures of Porto Rico are directly dependent on its agriculture

If the United States were as densely populated as is this island possession, how many inhabitants would it have?

What improvements have been made since the United States assumed control?

How does the value of the chief crop compare with the combined values of the three next most important crops?

How large a proportion of the land is improved farm land?

How does the law for the government of Porto Rico passed in 1917 differ from the earlier one under which the island was governed?

What language is spoken in the schools of Porto Rico?

How far from the sea is the farthest inland point?

at the height of its prosperity. Immediate aid was sent from the United States, and again the American Red Cross arrived to avert an inestimable calamity and to begin the rehabilitation of a devastated land and people. The Red Cross fed 510,161 persons, clothed 179,049, and distributed seeds for quick crops to 20,000 families. An effort was made to save the coffee crop by distributing pruning knives, and materials for rebuilding homes were furnished at a cost of $1,000,000. Property losses were estimated at $85,000,000, the greater part of which was agricultural. The coffee crop suffered most, for the sugar cane was only half grown when the storm struck, and though leveled by the winds, the pliable young stocks soon rose again. The coffee yield had promised to be the best since the last hurricane of 1899, but nearly seventy per cent of the plantations were destroyed, and a total loss of $25,000,000 was sustained, which was only partly covered by insurance. J.F.M'K.

Related Subjects. The reader who is interested in Porto Rico is referred to the following articles in these volumes

Banana	Spanish-American War
Coffee	Sugar
Molasses	Tobacco
Pineapple	

PORTO RICO TRENCH, greatest known depth of the Atlantic Ocean (which see).

PORT ROYAL. See ANNAPOLIS ROYAL.

PORT SAID, *sah eed'*, EGYPT. See EGYPT (Modern Cities).

PORTSMOUTH, ENGLAND. See ENGLAND (The Cities).

PORTSMOUTH, N. H. See NEW HAMPSHIRE (back of map).

PORTSMOUTH, OHIO. See OHIO (back of map).

PORTSMOUTH, TREATY OF. See RUSSO-JAPANESE WAR.

PORTSMOUTH, VA., is the most important naval station in the United States, and with Norfolk forms one of the leading coaling stations in the world. The two cities also constitute a Federal customs district. Portsmouth is situated in the southeastern section of the state, opposite Norfolk on the Elizabeth River, an inlet of Chesapeake Bay. Richmond, the state capital, is about 100 miles northwest, by rail, and 116 miles by water. The port is the terminus for a number of trans-Atlantic and coastwise steamship lines, and the Albemarle and Chesapeake and the Dismal Swamp canals provide communication with inland cities. The place was settled in 1752 and became a city in 1858. It has the city-manager form of government. Population, 1928, 61,600 (Federal estimate).

The most prominent feature of Portsmouth is the United States navy yard, located in the southern part of the city. It has a naval train-

ing school, a naval magazine, a plant for the building of steel vessels, and three large dry docks. Langley Field, one of the flying fields of the United States army, is also located here. The United States navy hospital, in the northern part of the city, is a little community in itself. It is situated in a park of eighty acres, which contains also the handsome residences and quarters of the attendants; the grounds, with their fine drives, walks, and beautiful shrubbery, provide a recreation park for the city. The National Home for Disabled Volunteer Soldiers is also located here.

Transportation. Ferries connect with Norfolk, Newport News, and Old Point Comfort, and railway transportation is provided by the Atlantic Coast Line, the Seaboard Air Line, the Chesapeake & Ohio, the Norfolk & Western, the Norfolk Southern, the Pennsylvania (Virginia Division), and the Southern railroads.

Industry. There are large wholesale houses and produce markets here. The surrounding territory is rich in agricultural products and coal. The commerce of the port of Norfolk-Portsmouth is chiefly in cotton, coal, lumber, black gum, vegetables, fruit, peanuts, oysters, grain, and fertilizer; it is the greatest peanut market in the world, and is one of the leading shipping points in the United States for berries, especially strawberries The immense coaling stations annually handle more than 2,500,000 tons of coal. The oyster, fish, and crab interests are also extensive. The manufacturing industries are represented by cotton, cottonseed-oil, knitting and lumber mills, a fertilizer factory, a fiber plant, and smelting works; the railway car shops of the Seaboard Air Line are located here, and the city is a growing center of the Virginia shipbuilding industry. A.L



The STORY of PORTUGAL

PORTUGAL, *pohr' tu gal*, a small nation with a long history, is now regarded as one of Europe's stable republics, though revolutionary attempts to restore the old monarchy have several times been made. It extends for about 350 miles along the southwest coast of the Iberian peninsula, sharing with Spain the area of that corner of Europe. While it has no natural north and east boundaries, except rivers for short distances, and no marked differences from its Spanish neighbors in the origin and language of its people, its history alone gives it distinction as a nation. The area of Portugal is 35,796 square miles, including the Azores and Madeira; that of continental Portugal is 34,604 square miles. This is nearly equal to the area of Indiana, but the republic, with over 6,000,000 people, has about double the population of the "Hoosier State."

Since there is but one province of the country which does not face the Atlantic, it is essentially a maritime nation and, unlike Spain, still retains large and important colonial possessions. Portugal derives its name from a little seaport called *Portus Cale*, now a suburb of Oporto.

The People. Phoenician, Carthaginian, Roman, and Greek colonists and Gothic and Moorish invaders were the ancestors of the Portuguese of to-day. A short people, with dark hair and eyes, the Portuguese are not unlike the Spaniards in appearance, but they are strikingly different from their light-hearted, keener-witted neighbors in temperament. Although their dress is flauntingly gay, they are a serious, sober-minded, and busy people, lacking the artistic and esthetic temperament of the other southern nations of Europe.

The throngs of beggars, typical of most southern cities, are not numerous in Portugal; the people generally are industrious and dependable. The burdens are carried upon the heads of the women, who do much of the heavy labor. The colonies have brought many French, English, and Dutch into Portugal, but emigration to other countries has steadily increased.

The Cities. Of the numerous cities of Portugal, two are outstanding. These are Lisbon, famous as the most beautifully situated capital city of Europe, with the exception of Constantinople, and Oporto, the great grape-wine seaport of Europe.

Lisbon, *lis' bon*, the immediate successor of Venice in the early modern period as the maritime queen of the Western world, is majestically situated on a low range of hills overlooking the Tagus River, at a spot where that stream broadens to a width of nine miles, about seven miles from the ocean In the background rises the lofty granite range of Cintra, and interspersed everywhere are semi-tropical gardens. Its harbor is one of the finest in the world—deep, well

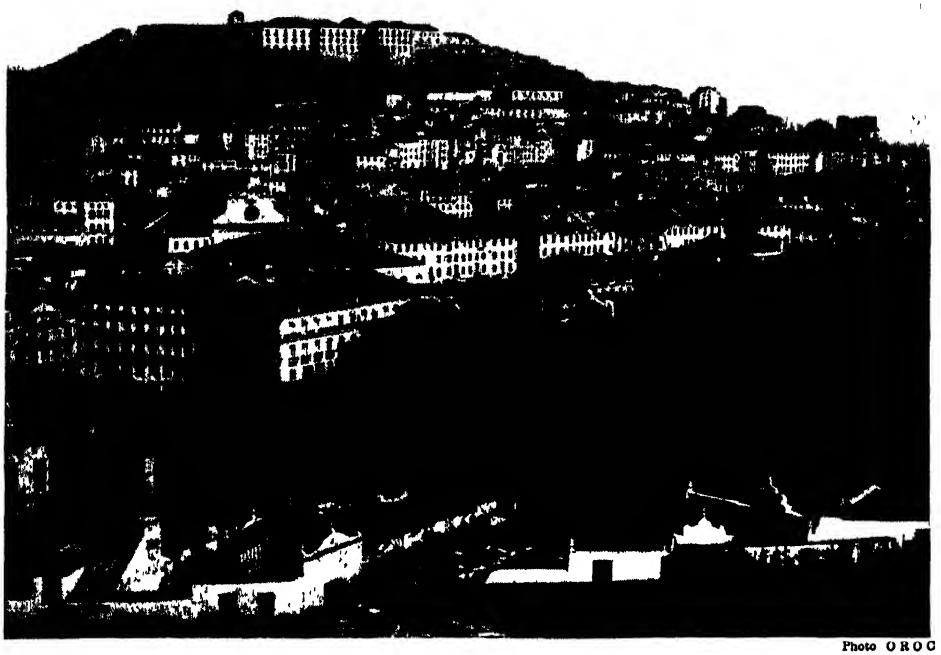


Photo O R O C

A CITY BUILT ON HILLS

A view of a portion of Lisbon, the capital and most important city of Portugal.

sheltered, and large enough to hold all the navies of Europe. The seeker after the picturesque must frequent the water front and the old section of the city which escaped the terrible earthquake of 1755; for the new quarter, constructed since that date, is decidedly modern, with wide, regular streets lined with fine homes and shops and adorned with many beautiful squares. One of the cleanest cities of Europe, Lisbon has a splendid water-supply and sewerage system. The old quarter lies under the shadow of Moorish castle walls, and presents many curious sights along the steep, narrow thoroughfares. Here no wagons pass, for the poor carry their burdens on their heads, and the more prosperous load down their donkeys.

The finest structure in Lisbon is the monastery and church of Belem, a monument to the great seamen of Portugal, begun in 1500. The monastery is now used as an orphanage The church of Estrella, with its dome of white marble, is a reduced copy of Saint Peter's at Rome. Besides its many educational institutions, Lisbon has a national public library of over 400,000 volumes, in addition to manuscripts and curios. The government offices, the customhouse, and the marine arsenal surround one of the city's finest squares, facing the bay. The manufacture of gold and silver wares, cotton spinning and weaving, and the canning of fish are now Lisbon's leading industries; its exports include wine, cork, fish, cattle, salt, and fruits. More than 25,000 people are employed in the cotton manufactures.

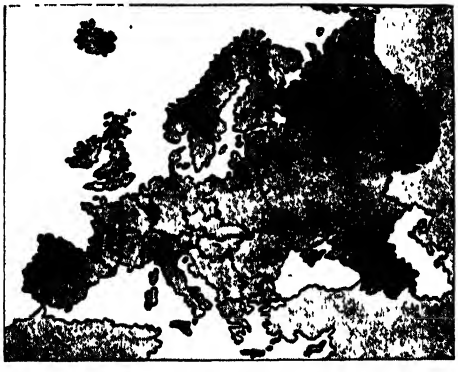
Previous to 1147, Lisbon was taken three times by the Christians from the Moors It has suffered severely from several earthquakes, and has been the victim of plagues. But the greatest disaster experienced was the earthquake of 1755, when in less than ten minutes most of the city was reduced to a heap of ruins. The nineteenth century was marked by several revolts, and the French occupied the city in 1807-1809 Since the deposition of King Manuel, in 1911, and the declaration of Portugal as a republic, the spirit of unrest, general throughout the republic, has centered in this city The Lusitanians called Lisbon *Olisipo*; the Visigoths, *Olisipona*; and its present name was derived from the Moorish *Lsshbuna*. Population, 1925, 529,535.

Oporto, *o pohr' toh*, an important city during the Middle Ages, and the seaport and chief industrial city, is next in size to Lisbon. Port wine, its principal article of export, takes its name from this town. Oporto is situated on the steep, rocky right bank of the Douro River, three miles from its mouth and about 175 miles northeast of Lisbon It is encircled by pine-covered mountains; and the houses, surrounded by wonderful gardens, rise irregularly from the river's edge. Of the bridges which span the Douro, one is counted among the largest and most beautiful of its kind in Europe. Crystal Palace, embowered by gardens and erected on one of the crags overlooking the river, and the "Tower of the Clergy," a granite structure 246 feet high, are two of the city's finest buildings.

Many of the old monasteries are still standing; one is a citadel; another is used as a barracks. There are also museums, libraries, a university, and many other educational institutions. Commerce and industry dominate the interests of this modern city, and manufacturing claims the time of one-third the

population. Distilleries, sugar refineries, textile industries, preserved foods, etc., represent the main types of industry of the city. Population, 1925, 215,625.

Surface of the Country. The coast of Portugal presents scenes of striking contrast, rising from marshes and sand dunes in the extreme north to steep, rugged cliffs which lift abruptly from the sea at Setubal, farther south, then



LOCATION MAP

dropping again to sandy beaches, to rise to inaccessible cliffs at Cape Saint Vincent. There are ten prominent capes, and four good harbors in the bays of Figueira, Ericeira, Setubal, and Sines. Not all of the bays and river mouths can be used as ports, because of reefs which make passage impossible except at flood tide. Even in the great harbor of Oporto, ships can pass the bar only at high tide.

The interior is a succession of pine-covered hills and mountains which are continuations, west and southwest, of the mountain ranges of Spain. Between these lie the valleys, in which are the fertile wine districts of Portugal. The Cantabrian Pyrenees spread over the two northern provinces, their highest ranges being only 4,815 and 4,665 feet high, or about the height of the Adirondacks in New York. The loftiest mountains in Portugal rise to 6,540 feet. The mountain slopes, wooded with nearly 2,000,000 acres of pine, furnish the timber of Portuguese commerce. There are about 800,000 acres of cork trees, and an even greater area of oaks.

Many swift tributary streams flow into the three great rivers—the Douro in the north, the Tagus in the central part, and the Guadiana in the south. As there are no inland lakes except the mountain lakes, the rivers are very important as commercial highways.

Climate and Rainfall. The climate of Portugal is notably equable and temperate; it is much like that of Central California. The average temperature is 61°, with a difference of only 20° during the year. In the eighteenth century, Portugal was a famous winter resort, but the lack of sanitation and improvements has turned the tide of tourists toward the Mediterranean shores in France and Italy. The heat in the valleys of the interior is often severe, but the surrounding mountains afford cool retreats.

The equable general temperature is caused by the sea winds and heavy rainfall, which though somewhat heavier in November, December, and January, is not confined to any one season. In the winter, the heavy rains cause the rivers to overflow, creating marshy districts where dense fogs prevail. The long summers and heavy rains develop luxuriant vegetation.

Mineral Resources. Although the mountains of Portugal contain great mineral wealth, these natural resources are largely undeveloped, because coal is scarce and transportation is neither cheap nor adequate. Wolfram is the most important mineral, and there are lead mines at Coimbra; copper is mined at San Domingo and other places, and antimony near Oporto, but most of the metal used is imported. The salt of Setubal is the chief mineral export.

Agriculture. The sunny hillsides and valleys are devoted chiefly to the cultivation of grapes. In a section twenty-seven miles long and five or six miles wide, about sixty miles from Oporto, sheltered from the sea and the northeast winds, are grown the sweet, black grapes from which is made port wine of the very best quality, to the extent of 13,000,000 gallons a year. About 39,000,000 gallons of olive oil is produced annually, from 825,000 acres. Mulberries are plentiful, and the industrious vinegrower of the north also cultivates the silkworm. The science of agriculture has been neglected until recent years, and the peasants do not allow experiments to be made to check the ravages of pests. Maize is cultivated to a large extent in the north. There are some fields of corn, potatoes, rye, and oats, and rice is grown in the lowlands, but the home production of cereals has not been sufficient to supply the country's needs. The people are so handicapped by poor transportation facilities and lack of fertilizers that it is cheaper for them to import wheat directly from Argentina.

Onions, beans, and sumac are raised, and lemons, oranges, peaches, and Elvas plums are abundant in the south. The country's production of cork is next in importance to that of Spain, 70,000 tons being produced annually. Portuguese olives are of finer flavor and cheaper than those of any other country. Two other important exports are port wine and livestock. Portugal is one of the few countries never visited by the cattle plague, and the beef is of excellent quality. Forty-nine per cent of the country is waste—not available for cultivation.

Manufactures. Portugal has fallen behind most European countries in the development of manufacturing industries. The potteries of Aveiro and the lace manufactures are losing their former reputation. However, textiles still hold first place in manufacturing industries, and the manufacture of azulejos, or porcelain tiles, continues to be one of the characteristic industries of Portugal. In the coast towns, shipbuilding and fishing are the chief industries. The sardine and tunny-fish industry is important, and canned sardines are one of the chief articles of export.

Transportation. Modern means of transportation and communication have prevailed in Portugal for some time. Over two thousand miles of railroads, the telegraph, and the telephone connect all of the important towns. In June, 1926, the largest railway company of the country took over the government-owned lines, the second largest system, and many improvements in rolling stock and methods of construction were made. The railways of continental Portugal are now practically owned by one company. One may reach Spanish markets by railroad from any of the chief cities. Although the country is about the size of Indiana, there are more than three times as many miles of railway in Indiana as in Portugal. The picturesque ox teams are still seen in rural districts and small towns, but the automobile and motor trucks have become the modern city conveyances. The large rivers, dotted with the bright-hued sails of the small boats of the vine-growers, are the chief commercial highways to the seaport.

Religion and Language. Until 1910, when the republic was established, Roman Catholicism was the State religion of Portugal. The Church has now been separated from the State, and all forms of worship are permitted; however, about eighty per cent of the people are Roman Catholics.

Cervantes said the Portuguese language was "Castilian without the bones." It is based on Latin, as is Spanish, but differs from the latter in accent and pronunciation. It lacks vigor and force, and has a soft, wailing cadence.

Education. Primary education is compulsory, and is rigidly enforced in the cities. As early as 1844, public instruction was regulated by law, and there were then seventeen secondary schools, having a high grade of teachers. However, the original regulation was not generally enforced, partly because schools were not available, and in 1911 a decree was promulgated which improved the situation and set down drastic rules for enforcement. There are about 7,200 elementary and more than thirty secondary schools, besides special colleges and normal-training courses in the universities at Lisbon, Coimbra, and Oporto. In spite of these educational opportunities, more than half of the people over ten years of age are unable to write, and illiteracy, though decreasing, has long been notorious in Portugal.

Government and History

Government. A republic was declared in Portugal on October 5, 1910. A provisional government was established which lasted until August 20, 1911, when a Constitution was adopted. This provides for a legislative body of two chambers; the lower chamber, or National Council, consists of 164 members, elected directly by the people for a term of three years; the upper chamber has seventy-one members, elected by the municipal councils, one-half of the membership being renewable every three years. The President is elected by both chambers for one single term of four years, and he must be at least thirty-five years of age. He may not be present in the Chambers during debates. He appoints the Premier and seven Ministers, all of whom are responsible to Parliament. The Constitution may be revised every ten years.

Colonies. The estimated population of the colonies of Portugal is about 9,000,000, about fifty per cent greater than the population of Portugal itself; their area is more than twenty-four times that of the republic. The Azores archipelago and the island of Madeira are considered a part of the republic, and are a part of the home government. The Cape Verde Islands, 300 miles from the west coast of Africa, peopled by the Portuguese and the negroid race, are of strategic and commercial importance. In Africa, Portuguese Guinea, a territory of about 14,000 square miles, inhabited by warlike natives, refugees, and exiles, was important in the days of the slave trade. Prince's and Saint Thomas's islands, off the coast of Africa, are very fertile and produce important revenues. Cacao plantations cover 125,000 acres, and cacao is the most valuable export; other products are coffee, rubber, and cinchona. Other African possessions are Angola, on the west coast, and Mozambique, on the East African coast. The Asiatic colonies are largely in the Indian Archipelago; Damao, Diu, Goa, and Macao in China are important commercial centers for Portugal's Far Eastern trade.

Early History. The earliest historical colonists of Portugal came from Carthage and Phoenicia. Later, Greek colonies were founded at the mouth of the Tagus, and during the Roman Empire, Latin settlements were made. Some historians have identified Portugal as ancient



Photos: U & U

Scenes in Two Cities. At the left is the Plaza of Commerce in Coimbra, an ancient university city; this town was the capital of Portugal from 1139 to 1506. At right the Avenue of Dom Pedro, in the city of Oporto; this street is celebrated for its beautiful mosaic pavement.







Lusitania In the fifth century, the whole peninsula was overrun by the Visigoths, and in the eighth century Portugal was conquered by the Moors. The rule of the Moorish caliphs was wise, and the country prospered until the tenth century, when their power weakened Centuries of fierce warfare between the Moors and Christians followed. Ferdinand the Great, of Castile, Leon, and Galicia, in a series of battles conquered the Moors. In 907 the Moors began to lose ground, and the first portion to be won from them was the region of Oporto, seized in that year by Bermudo II, king of Galicia. Bermudo's successor, Ferdinand I, the Great, continued the conquests, taking Beira in 1055, and progressing south until in 1064 he had rounded out the territory as far as Coimbra. The districts were organized according to the feudal system as counties under Galicia, and a seaport near Oporto, the Roman Portus Cale, furnished the name for the new nation.

Ferdinand was succeeded by his three sons, Sancho, Alfonso, and Gaucia, but quarrels among the brothers finally left Alfonso the successful one, and he reunited his father's kingdoms in 1073 and reigned as Alfonso VI. He was called upon to continue to combat the power of the Mohammedans, and among the Christian knights who came to help him, and incidentally to acquire added dominions for themselves, was Count Henry of Burgundy, whom Alfonso rewarded with the counties of Oporto and Coimbra and the title of Count of Portugal. From that year, 1095, the history of Portugal became distinct, and a great dynasty was founded through the son of Henry of Burgundy

The Line of Kings. Henry's son, Alfonso Henriques, was the first king of Portugal. He extended the kingdom by repeated victories over the Moors, and in 1147 he took Lisbon, which he made his capital His son, Sancho I, won the name of "The City Builder." During his reign and those of his successors, Alfonso II and Sancho II, the country was chiefly occupied in quarrels with the Papal power Under Alfonso III (1248-1279), Portugal attained its European limits, Mohammedan warfare was concluded, and the constitutional history began.

From 1279 to 1325, under Denis, peaceful progress succeeded warfare; the first commercial treaties with England were made, the navy was founded and schools were established. During the rule of the succeeding kings, Alfonso IV and Pedro I, the court had grown powerful and corrupt, and when Ferdinand came to the throne in 1367, the monarchy had reached a crisis, but he overcame internal difficulties and spent the sixteen years of his reign in war with Spain. The dynasty terminated with Ferdinand.

Expansion by Exploration. At his death, John I was chosen king, and this new line is generally known as the House of Aviz. His son, Prince Henry the Navigator (see his biography in these volumes), under whose direction and inspiration the Portuguese sailors ventured along the west coast of Africa into unknown seas in search of a route to India around Africa, contributed materially to the fame of his father's reign. By 1420 Madeira had been rediscovered, and before King John's death, the Azores had been reached. Through the reigns of his three successors, Edward (1433-1438), Alfonso V (1438-1481), and John II (1481-1495), explorations and discoveries continued, and were of first importance to the country. During the years from 1433 to 1455, Baldaya, Tristam, Dias, and Cadamosto ex-

plored the western coast of Africa; in 1456 the Cape Verde Islands were discovered; Dias sailed around the Cape of Good Hope in 1486. In 1493 Pope Alexander VI's famous demarcation line was drawn, by which Portugal was to have all the discoveries east of a meridian 300 miles west of the Azores and Cape Verde Islands, and the next year a treaty extended the line to 1,110 miles west of the Cape Verde Islands.

A "glorious age" followed under Manuel "the Fortunate" (1495-1521), and two years after he took the throne, Vasco da Gama found the Cape route to India. In 1500 Brazil was added to Portugal's possessions through the discoveries of its sailors. Vasco da Gama's voyage to India revolutionized the routes of trade, and Lisbon replaced Venice and Genoa in commercial supremacy. Europe now faced west and not east, and a new era was begun. This age of luxury, absolutism, and adventure was followed by a rapid decline during the reign of John III. The Inquisition stamped out the revival spirit; the Jews, who possessed the wealth of Portugal, were expelled; prestige was lost in India and Africa; and the kingdom was weakened at home by increased emigration.

King John's three-year-old grandchild, Sebastian, succeeded him at his death in 1557. The young ruler's daring spirit and uncurbed ambition caused him to invade Morocco in 1578, but the campaign proved disastrous; Sebastian was killed in the Battle of Alcazar, and his army was practically annihilated. This was the beginning of the loss of dominions which Portugal had gained through exploration and conquest.

Later History. Cardinal Henry, the only remaining representative of the old Burgundian line, succeeded Sebastian, but he was then an old man and only ruled two years (1578-1580). The succession was contested by various relatives of the royal house, of whom Philip II of Spain, whose grandfather was King Manuel, was most powerful. Portugal was then made a part of the Spanish monarchy. During the period of Spanish rule, the English, Dutch, and French attacked the Portuguese colonies, and the Spanish held the lands and offices at home. This condition had lasted sixty years when the Duke of Braganza expelled the Spanish, and was crowned king as John IV, the first king of the House of Braganza; this line continued to be the royal family until a republic was proclaimed. The most interesting part of Portugal's history ends with the beginning of the seventeenth century. The commercial power and prestige it had gained through discoveries declined until the country became really a commercial dependent of England. The Treaty of Lisbon, 1668, settled the war with Spain, and Portugal was again recognized as independent. During the reigns of Alfonso VI, Pedro II, and John V, Portugal's foreign relations, especially those with England, were strengthened. In 1703 the Methuen Treaty, between Portugal and England, was signed. This treaty established Portugal's wine trade, and by admitting English manufactured goods free, it caused the decline of Portugal's manufacturing industry. The reign of Joseph I (1750-1777) was one of much-needed reform and progress, but at this time occurred the depressing incident of the great earthquake at Lisbon, in which 40,000 perished (1755).

At the time of the French Revolution, Portugal was again drawn into war, through its alliance with England. The Peninsular War, which took place at this time, involved Spain and France. These were allied against Portugal,







which later sought aid from Great Britain. Spain declared war on Great Britain in 1796, and the following year made an agreement with France for the partition of Portugal. In February, 1801, Portugal declared war on Spain, and four months later an unsatisfactory peace was made; Napoleon ratified this, with the intention of later inciting the Portuguese into another state of war. Napoleon's Berlin Decree of 1806 attempted to close all continental ports to British trade—a provision which Portugal refused to sanction—and the following year the Treaty of Fontainebleau was signed by Spain and France, by which they again determined to partition Portugal.



Photo: U & U

A CORNER OF AN OLD MONASTERY

In 1807 French forces occupied Lisbon, and Junot set up a military government. England sent aid to Portugal under General Wellesley, who routed the French at the Battle of Vimeiro, in 1808. John VI, the former regent, who had fled to Brazil, returned to a people imbued with the idea of constitutional government, and intent upon freeing themselves from the absolute autocracy of the court and clergy. A highly democratic Constitution was drawn up, including freedom of religion and press, abolition of class privileges, and granting the Crown only a suspensive veto. This instrument, known as the Constitution of 1822, was sworn to by John VI, though against his will. In 1822 Brazil declared its independence of Portugal, a loss which so angered the army that the soldiers threw their support to the royal party under the head of Miguel, son of King John, who abrogated the Constitution of 1822.

Not satisfied with his father's measures, Miguel and his men seized the royal palace in 1824, but the revolt was put down by British assistance, and Miguel went into exile. At the death of John VI, his son Pedro became king as Pedro IV, and a Constitution providing for a bicameral legislature, consisting of an elective House of Deputies and an hereditary House of Peers, and granting the fundamental liberties to the citizens, was promulgated in 1826.

After the death of John VI, a period of civil strife followed, and republican feeling was continually growing stronger. New constitutions were adopted, and during the reign of Pedro V (1853-1861), there was a great revival of national spirit. Railroads, telegraphs, and the school system were improved and extended. As a result of the plague in Lisbon, in 1861, in which the king died, much-needed sanitary reforms were accomplished.

When Luiz succeeded Pedro V, in 1861, more changes in the government were necessary. Slavery was abolished in all Portuguese colonies in 1869, education was reformed, new railways were built, and the general economic conditions of the country improved. King Luiz died in 1889, and was succeeded by his son Carlos. Extravagance and financial mismanagement increased the already enormous public debt, and monopolies were granted the government in an effort to reduce the debt. Serious uprisings and strikes aroused the country to protest against Franco, the Prime Minister, who had assumed a dictatorship. He was a man of impeccable integrity, who had the welfare of his country at heart and a sincere desire to adjust the finances, but his arbitrary decrees, which were upheld by the king, caused discontent, and ultimately resulted in the assassination of King Carlos and the crown prince on February 2, 1908, in the streets of Lisbon.

Manuel II, the second son of Carlos, tried to establish a truly representative government, but party struggles had progressed too far and politics was too corrupt. The Republican party gained a large majority, causing the fall of the monarchy in October, 1910. The royal palace was shelled, and Manuel fled from Portugal, taking refuge in England, which thereafter was his home. In this revolution, the



Photo: Keystone

One of Hundreds of Great Churches in Portugal. Portuguese architecture is seen at its best in its churches. This building is in the city of Lisbon.

Outline and Questions On Portugal

I. Position and Size

(1) Latitude, 37° to 42° north
(2) Longitude, 6° 15′ to 9° 30′ west
(3) Part of Iberian peninsula
(4) Area
  (a) Actual
  (b) Comparative

II. Geography

(1) Coast line
  (a) Varied character
  (b) Length, nearly 500 miles
(2) Surface features
  (a) Mountains
  (b) Fertile valleys
(3) Rivers
(4) Climate

III. Industries and Commerce

(1) Limited mining operations
(2) Agriculture
  (a) Vine-growing
  (b) Other phases
(3) Manufacturing
(4) Transportation
(5) Commerce

IV. The People and Their Condition

(1) Population
(2) Resemblances to Spaniards
(3) Absence of beggars
(4) Language and literature
(5) Religion
(6) Education
(7) Government
  (a) Republican in form
  (b) Departments
  (c) Colonies

V. History

(1) Earliest years
(2) The glorious age of discovery
(3) The decline
(4) Relations to other countries
(5) Revolution and establishment of republic
(6) The World War
(7) Post-war period

Questions

If Portugal's colonies were as thickly populated as the mother country, what would their combined population be?

What state in the United States does Portugal most closely resemble in size? How do the two compare in population?

How do the Portuguese differ from their Spanish neighbors?

Which has the higher mountain peak, Spain or Portugal?

What famous product is named for Portugal's chief seaport?

Why do we see no Portuguese olives on the market?

whole death roll did not exceed a hundred persons.

A provisional government was established, and the present Constitution was adopted one year later; Dr. Manoel Arriaga became first President of the republic.

The World War and Post-War Period. Portugal early showed its sympathies in the World War. By treaty with Great Britain, it was bound to furnish 10,000 troops whenever that nation, in war, required it. Before the close of 1914, Portuguese troops attacked German colonies in Africa to protect their own possessions, but made no further hostile move until February, 1916, when forty-four German trading vessels which had been interned in Portuguese harbors to secure safety from the English and French were confiscated. Germany demanded their release; no attention was given to the ultimatum which followed, and on March 9 Germany formally declared war on the republic.

Although Portugal emerged from the war with a heavy debt, the economic future was promising. At the Spa Conference in July, 1920, Portugal secured three-quarters of one per cent as its share of the indemnity from Germany, and also received German East African Kionga, about 400 square miles.

The period immediately following the great war was one of continued political disturbances. From the time the republic was founded, up to May, 1926, there were eighteen revolutions, and forty Presidential Cabinets were overthrown. The revolutionary movements during 1920 and 1922 became an accustomed political weapon and resulted in very little loss of life. Perhaps none was so seriously felt as the assassination of President Paes, which occurred in December, 1918. The revolts of 1925 and 1926 were of a less violent nature, and indicated that the inclination of the army was to expel the politicians from power. General Carmona, after a bloodless revolution in the summer of 1926, set himself up as Premier and Minister of War in a new Cabinet which he selected, and by November 29 he had assumed the Presidency of the republic, though extra-legally. He continued in this position of virtual dictator, but in 1928 an election secured his position and gave it a legal status.

A peculiar decree issued in September, 1928, required everybody to wear shoes, but the authorities found it difficult to enforce this bit of modernism. In spite of the constant political dissensions, there was a considerable increase in industry after the World War. Although the value of the escudo, the unit of currency, fell from the par value of $1.0805 to $0.051, wages increased, in some cases between twenty and thirty times more than the pre-war rates. J.F.M'K.

Related Subjects. The reader who is interested in Portugal is referred to the following articles in these volumes.

COLONIES

Angola	Portuguese Guinea
Mozambique	

ISLANDS

Azores	Madeira
Cape Verde	

LEADING PRODUCTS

Cork	Olive
Grape	Port Wine
Mulberry	

UNCLASSIFIED

Demarcation, Line of	Moors
Gama, Vasco da	Pyrenees
Henry the Navigator	World War

PORTUGUESE, EAST AFRICA, former name applied to Mozambique (which see).

PORTUGUESE GUINEA, *gin' ie,* a Portuguese colony on the northwest coast of Africa, wedged in between the French possessions of Senegal and French Guinea. The area is 13,904 square miles, and the population is estimated at about 800,000. Bissagos Islands, off the coast, form a part of the colony. The capital is Bulama, on an island of that name in the delta of the Rio Grande, or Comba; it has a safe harbor, and with Bissau, the chief port, handles the commerce of the colony. Portuguese Guinea is an alluvial plain with a tropical climate that is oppressively hot and unhealthful. The chief products are rubber, ivory, hides, oilseed, rice, millet, and wax.

The government is administered by a Portuguese governor and council, appointed by the Lisbon government, however, outside of the trading stations, native life and government, if such exists, are undisturbed by Portuguese authority, and little has been done by the mother country for the development of the colony. Manners and practices of the tribes are much the same as the Portuguese sailors probably found when they discovered Bulama Island in 1446. A military force of 250 men is maintained, including about 150 natives. Owing to the predominance of French colonies in the vicinity, most of the commerce is controlled by that nation. The inhabitants are of many tribes, each maintaining its own customs, religion, and language, and they seldom mix or intermarry. The Portuguese inhabitants consist of officials, soldiers, and a few traders.

There was a long-standing dispute between England and Portugal concerning ownership of this colony. In 1870 the United States government was called upon to act as arbitrator between the two powers, and the matter was settled in favor of Portugal.

PORTUGUESE WEST AFRICA, a name applied to the colony of Angola (which see).

PORT WINE, a strong, full-flavored, nonsparkling red wine, made from grapes. It takes its name from its principal original shipping place, Oporto, Portugal. The grapes were grown in the rocky gorges about sixty miles north of the town. The climate gives the fruit a peculiarly wild, strong flavor, and this characteristic was strengthened in the wine by the crude methods used in its manufacture. The grapes were trodden by foot for twenty-four hours; the juice was then fermented in open vessels, and rather large amounts of brandy were added from time to time. It was then allowed to mature for at least four years. The modern industry flourishes, and 13,000,000 gallons are produced annually.

Port wine is now produced in various parts of the world. In America, California led in its production until the advent of prohibition; the brand made there was known as domestic port. Cooking wines are still made there, but enough salt is added to make them legally salable.

Port wine has a large percentage of alcohol, and, while sometimes prescribed for convalescents, is likely to damage the tissues of the stomach when used regularly. See YEAST; BACTERIA AND BACTERIOLOGY; PORTUGAL (Agriculture).

POSEIDON, *po si' dun,* the Greek name for the god whom the Romans called Neptune (which see).

POSEN, *po' zen,* OR **POZNAN,** *pawz' nahn y'* (Polish), a western county of the republic of Poland, with an area of 10,242 square miles.



LOCATION OF POSEN

Posen was originally a part of the old kingdom of Poland, but was taken by Germany in the Polish partition of 1795, and remained a province of Eastern Prussia until 1919. Its present status in the Polish republic was fixed by the Treaty of Versailles. During the World War, this section was invaded by the Russians, and was the scene of severe battles. The county has a population of about 1,968,000. Most of the people are Poles of the Roman

Catholic faith. The chief towns are Posen, the former provincial capital; Gnesen, Bromberg, Hohensalza, and Schneidmühl. For description of the city of Posen, see POLAND (The Cities). See, also, WORLD WAR; POLAND (History).

POSITIVE, in photography. See PHOTOGRAPHY.

POSTAGE AND POSTAGE STAMPS. Postage is the charge assessed by a government for conveying a letter or other piece of mail matter to its destination; postage stamps are small printed labels, either of the adhesive variety which are pasted on the mail, or those that are impressed on an envelope, card, or wrapper to show that the charge has been prepaid.

Rates of Postage. In the early days of postal service, the charges for delivering mail depended chiefly on the distance the courier had to travel. Later, when stagecoaches were used, distance was still the chief factor, but to-day, in an age of steam and electricity, domestic rates in nearly all parts of the world are based only on weight and character of mailable matter. The rate to foreign countries may be higher.

United States. Domestic rates of postage apply to all matter whose destination is within the United States or any of its possessions, or in other places where United States mail service is provided; with certain exceptions, to Canada, Cuba, Newfoundland, Mexico, the republic of Panama, and several other Central and South American countries; and also to any matter addressed to officers or men of the United States navy on duty abroad, wherever they may be. Foreign rates apply to all other countries; in some cases these do not exceed domestic rates.

All mail matter is divided into four classes, each with special rates:

1. The first class includes letters, postal cards (issued by the government), "post cards" or private mailing cards, any matter sealed or closed so that it cannot be inspected, and all written matter, whether sealed or unsealed. On this class the domestic rate of postage is two cents for each ounce or fraction thereof; on local or "drop" letters in towns or rural districts which have no free-delivery system, the charge is one cent for each ounce or fraction. This lower rate applies only to letters mailed in the town of their destination The domestic rate on postal cards is one cent; private mailing cards, written or printed, if they are substantially like government postal cards in size and weight may go for one cent; those not conforming must carry the letter rate of two cents, etc. The foreign rate is five cents for an ounce or fraction of an ounce for letters, and three cents for postal cards. Letters to the following countries are carried at the domestic rate:

Alhucemas Island, Andorra, Anguilla, Antigua, Argentina, Aruba, Bahamas, Barbados, Barbuda, Balearic Islands, Bermuda.

Bolivia, Bonaire, Brazil, British Guiana, British Honduras, Caicos Islands, Canada, Canary Islands, Cayman Islands, Ceuta, Chile.

Colombia, Cook Islands, Costa Rica, Cuba, Curaçao, Dominica, Dominican Republic, Dutch West Indies, Ecuador.

England, Grenada, Grenadines, Guatemala, Haiti, Republic of Honduras, Northern Ireland, Irish Free State, Jamaica, Labrador, Leeward Islands, Melilla.

Mexico, Montserrat, Nevis, Netherland West Indies, Newfoundland, New Zealand, Nicaragua, Panama, Paraguay, Penon de Velez de la Gomera.

Peru, Redonda, Saba, St. Christopher, St. Eustatius, St. Kitts, St. Lucia, Dutch part of St. Martins, St. Vincent, El Salvador, Western (British) Samoa.

Scotland, Spain and its colonies, Tangier, Tobago, Trinidad, Turks Island, Uruguay, British Virgin Islands, Wales, Windward Islands.

A two-cent rate applies to the post cards sent to the above-mentioned countries. Letters to Germany at the two-cent rate are carried only by steamers which deliver mail at German ports; letters at the five-cent rate are sent by the quickest route.

2 Rates for second-class mail which affect the general public apply to transient newspapers and magazines mailed by individuals The charge is one cent for each two ounces or fraction thereof, and no limit of weight is imposed.

Formerly, second-class mail included only newspapers and magazines mailed in bulk by publishers and news agents. Special zone rates now apply to these

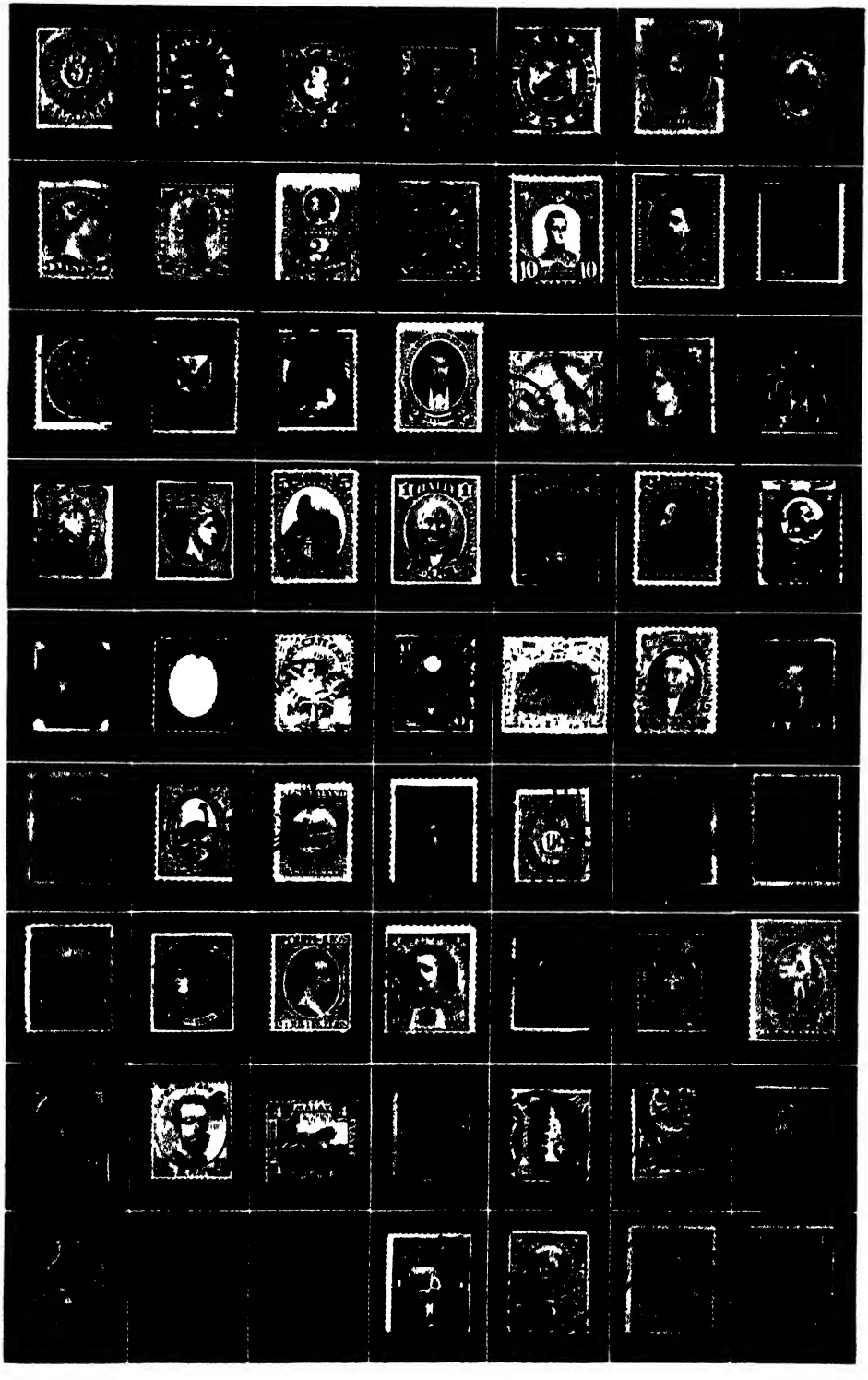
3. In this class are included merchandise and printed matter, up to a weight of eight ounces. Included in mailable material under this class and to the maximum weight named are books, catalogs, seeds, cuttings, bulbs, scions, and plants. For printed matter in bound form up to twenty-four pages in size, and all miscellaneous circular matter, unbound, the rate is one and one-half cents for each two ounces or fraction thereof; for the other commodities listed, one cent for each two ounces or fraction.

4. In the fourth, or parcel post, class are included merchandise and printed matter, including books of weight exceeding eight ounces, up to fifty-pounds, in zones four to eight, and up to seventy pounds in zones one to three, inclusive. The rates of postage are those of zones (see article PARCEL POST).

Insured and C. O. D. Mail. Third- and fourth-class mail may be insured, at a fee, in addition to postage, of five cents for a value not exceeding five dollars, eight cents when the value is above five dollars and not in excess of twenty-five dollars; ten cents for value between twenty-five and fifty dollars; and twenty-five cents for value between fifty and one hundred dollars The same classes of mail may be sent C O. D. to all money-order offices, at a collection cost of twelve cents for sums up to ten dollars, fifteen cents for amounts between ten and fifty dollars, and twenty-five cents for sums from fifty to one hundred dollars.

Air Mail. Mail may be carried by airplane at a rate of five cents for the first ounce, or fraction thereof, and ten cents for each additional ounce. Foreign rates are the same for the countries to which two-cent postage rates apply; three cents in addition to air-mail rates is charged for the other countries.

Foreign postage on printed matter, on commercial papers (including deeds, invoices, bills



(For Key, see back of plate.)

FINDING LIST OF STAMPS

1 Argentina, 1861
2. Australia (Victoria), 1865
3. Austria, 1850
4. Belgium, 1863
5 Bolivia, 1894
6. Brazil, 1866
7. Bulgaria, 1881
8. Canada, 1869
9 Ceylon, 1880
10 Chile, 1878
11 China, 1898
12 Colombia, 1899
13 Costa Rica, 1887
14 Cuba, 1878
15 Denmark, 1870
16 Dominica, 1885
17 Dutch Indies, 1899
18 Ecuador, 1894
19 Egypt, 1888
20 France, 1849
21 French Congo, 1892
22 Germany, 1875
23 Greece, 1861
24 Guatemala, 1882
25 Haiti, 1887
26 Hawaii, 1882
27 Honduras, 1878
28 Hungary, 1871
29 India, 1866
30 Italy, 1862
31 Jamaica, 1889
32 Japan, 1883
33 Liberia, 1896
34 Mexico, 1864
35 Netherlands, 1867
36. Newfoundland, 1866
37. New South Wales, 1888
38. New Zealand, 1900
39 Nicaragua, 1894
40 Norway, 1883
41. Paraguay, 1884
42 Persia, 1881
43 Peru, 1882
44 Philippine Islands, 1872
45 Porto Rico, 1890
46 Portugal, 1898
47 Rumania, 1879
48 Russia, 1882
49 Salvador, 1888
50 Siam, 1900
51 Spain, 1872
52 Straits Settlements, 1900
53 Sweden, 1858
54 Switzerland, 1882
55 Turkey, 1884
56 United Kingdom, 1841
57. United Kingdom, 1887
58. United Kingdom, 1887
59 United Kingdom, 1887
60 Uruguay, 1889
61 Uruguay, 1889
62 Venezuela, 1883
63 Venezuela, 1883

of lading, etc.), and on merchandise is one cent for two ounces. The first three classes of mail may be registered for a fee of fifteen cents, if the value does not exceed fifty dollars, and twenty cents for value between fifty and one hundred dollars, the rate advancing ten cents with each additional hundred dollars up to $800; and for the values between $800 and $1,000, the maximum, one dollar, is charged. Mail may also be sent by special delivery for ten cents extra fee for weight to two pounds; fifteen cents up to ten pounds; and twenty cents for heavier weights up to maximum. See POSTOFFICE DEPARTMENT.

Canada. The rate for letters posted in the Dominion, and addressed to any place within its limits, Great Britain and Ireland, British possessions, Mexico or the United States, is two cents an ounce or fraction thereof. Post cards addressed to a Canadian, Mexican, United States, or British point are charged at the rate of two cents each; to most other foreign points, four cents. Letters must be at least partially prepaid; double the deficiency in postage is charged when an underpaid letter is delivered.

Newspapers and other periodicals published in Canada not less than once a month and addressed to subscribers in the Dominion, Great Britain, and certain other places in the empire bear postage at the bulk rate of one cent per pound. Canadian newspapers and periodicals sent from the Dominion to any place in the United States or Mexico are liable to a rate of one cent for each four ounces. However, publications which appear not oftener than once a week and not less frequently than once a month may be sent free to subscribers and dealers within a radius of forty miles from the office of publication or from any postoffice, provided that the postoffice chosen is not more than forty miles from the office of publication.



Photo: Keystone

HOW POSTAGE STAMPS ARE MADE

The machine shown above prints, gums, and dries the stamps. There are ten stamps in each row.

The rate on books to be delivered in any country of the International Postal Union is one cent for two ounces, which is also the rate for other printed matter and for samples of merchandise. See POSTAL UNION, INTERNATIONAL.

Rates in Other Countries. The domestic postage rates in all countries which are members of the International Postal Union are practically identical. For example, the domestic letter rate in Great Britain and Ireland is one penny; in Germany, ten pfennig; in France, ten centimes; in Mexico, twenty-centavos; in Italy, ten centesimi; in Norway, ten öre; these rates are all the nearest equivalent of the Canadian and United States rates of two cents. The rate on foreign first-class postage is in most places the equivalent of five cents for the first ounce (see above, under *United States*).

Postage Stamps. Strictly and correctly used, the term *postage stamps* includes only those stamps which are used for the prepayment of postage. Other classes, such as postage due, official revenue, and newspaper stamps are not postage stamps, although they are commonly grouped under that title. A *postage due* stamp, affixed by the postmaster, is a convenient way of indicating that the prepaid postage is insufficient. In the United States, in fact, postage-due stamps are used only on domestic mail; letters and packages arriving from foreign countries are merely stamped "Due, five cents" or whatever the amount may be.

All countries which belong to the International Postal Union use a fixed scheme of colors for stamps which are equivalent in value to the one-cent, two-cent, and five-cent United States or Canadian stamp. These values are the ones chiefly used for domestic and foreign postage. The one-cent color is green, the two-cent is red, and the five-cent is blue. These colors are permanently adopted, and whenever

the mail clerk sees a blue stamp, even if the words on it are in a language he cannot read, he knows that five cents or the equivalent has been paid.

[Pictures of stamps which are in current use cannot be printed in a general publication; hence this special article cannot be illustrated with stamps used at present.]

Stamp-Collecting. The collection and study of stamps is sometimes considered as merely a hobby. Far from being valueless, it is a pastime of great interest and of educational value. Even the youngest child who begins a collection learns the names of the different countries of the world. If he knows nothing more about them than their names, his natural curiosity will soon lead him to further inquiry. He also learns the standard of coinage from the values on the faces of the stamps. If, as in Great Britain and the British colonies, the head of a ruler appears on the stamp, he will soon learn who the ruler is. Other stamps show local views, or bits of famous scenery, native animals and plants, characteristic devices in heraldry or arabesques, all of which the child or adult assimilates, perhaps unconsciously. The collection and study of stamps is called *philately*. See HERALDRY.



Photo Bain Service

POSTAL UNION MONUMENT
At Berne, Switzerland [See next page]

Besides learning much geography, the stamp-collector cannot help but learn something of history. For example, if he turns to France, he will find that some stamps bear the legend *Empire Français*, and some *Republique Française*. The question naturally arises, When was France an empire, and when did it become a republic? Again, the stamp-collector will wonder what the Roman states were, and why they no longer issue stamps, and why Italy's first issue of stamps was in 1851.

Most collectors begin their study with general collections, made up of all the stamps of all the countries they can obtain. Later, certain kinds of stamps or certain countries appeal more strongly, and the collector begins to specialize. He may confine his attention to a group, such as the states which make up the British Commonwealth of Nations, or he may gradually narrow down the field to a single country.

Rare Stamps and Great Collections. The rarity of a stamp is determined not by its age but by its scarcity. There are literally thousands of stamps which can be purchased for a few cents apiece. Nearly all dealers prepare assortments of stamps ranging in quantity from two to 4,000 or 5,000, and in price from five cents to $100. The larger assortments are good collections in themselves; if the purchaser can afford to add to them, they form an excellent basis for a large general collection. It has been estimated that the governments of the world have issued 25,000 different stamps.

The rarest of all stamps is the one-cent, issue of 1856, British Guiana, of which only one copy is known to exist, this specimen is in a private collection in Paris, probably the greatest collection in the world. Next in value, though not in scarcity, are the one-penny and two-penny Mauritius of the issue of 1847, a pair of which is worth about $5,000. Only fourteen copies of the one-penny and twelve of the two-penny are known to exist. Single specimens have been sold for $1,500 to $3,000, depending on their condition.

There are quite a number of postage stamps of which only ten or fewer specimens are known, but for some reason or other, they are not as popular and do not bring as high prices as the early Mauritius.

Of the United States stamps, the rarest are the provisional issues of Baltimore and of Boscawen, N. H. (only one copy of the latter is known); these stamps were issued by the local postmasters in 1845 and 1846, under authority of the United States government. Of the regular stamps issued by the government, perhaps the rarest is the 90-cent of the 1851 issue. Canadian stamps, as a whole, do not bring high prices, the chief exceptions being the 12-penny stamps of 1851 and 1852, which are valued at $400 to $600, according to their condition. An almost complete collection of Canadian stamps can be formed for a comparatively small expenditure.

[The bibliography of stamps and stamp collecting is vast. Every collector should own at least one of the standard catalogues issued by the leading dealers. Their cost is small, and they are of great help in teaching the beginner the value and identity of different varieties. Dealers and philatelic associations also publish stamp journals, which contain much interesting information.]

POSTAL SAVINGS BANKS. See BANKS AND BANKING, subhead.

POSTAL UNION, INTERNATIONAL. In 1874 all European countries, the United States, and Egypt signed a covenant at Berne, Switzerland, which founded a postal union. This union, later called the Universal, or International, Postal Union, established uniform rates of postage between member countries, and, at congresses held every five years, it prescribes new international postal regulations. At the Congress of 1891, it was decided to establish headquarters in Berne. The settlement of accounts between members of the Union has been greatly facilitated by this international clearing house.

Throughout the World War, the Union, in its capacity as a neutral organization, maintained continual contact between the postal administrations of belligerent countries. Neutral nations acted as intermediaries for the transmission of postal matter to prisoners of war. So valuable and important was the service of the Union that it added greatly to the prestige and post-war strength of the organization.

It was at the first congress after the war, held in Madrid, Spain, in 1920, that domestic rates were established between all states in the Pan-American Union (which see), which includes all countries of the American continents except Canada and the British colonies.

For the first time in the history of the Union, regulations of aerial postal service were introduced at the Madrid Congress. They prescribed that aerial services are to be included in the category of extraordinary postal services, which are regulated by private arrangement between administrations concerned.

In 1924 the Union held its congress at Stockholm, Sweden. This congress reduced transit charges and other rates, made new and more convenient rules for publishers, and authorized the insertion of objects liable to customs duties in packets, dispatched at letter rates, when the import of such objects by letter is permitted in the country of destination. Aerial-mail regulations were also modified in the direction of greater convenience.

The International Postal Union embraces most of the civilized and semi-civilized countries of the world. See POSTAGE AND POSTAGE STAMPS; also illustration, page 5770.

POST EXCHANGE. In an army post in the military establishment of the United States, the post exchange is a place where the soldiers may purchase food, clothing, and other needful things. The name for this military store was *canteen* until 1901, when the present term was adopted.

POST MORTEM, meaning "after death," is the examination of a human body to ascertain the cause of death. Excepting in cases in which crime is suspected, a post mortem may not be made without the consent of the nearest relatives. See CORONER.



POSTOFFICE DEPARTMENT, a government department or institution for the conveyance and delivery of letters, papers, and other matter legally mailable. The name *post* is of Latin origin, from the "stations" along the roads of the Roman Empire where messengers or couriers were kept in readiness to relay dispatches. The postoffice as it is known to-day is in all essential features a modern institution. Originally, it served only the government, particularly in times of war. The first regular postal service to be used by private individuals seems to have been established as early as the thirteenth century, between the cities of the Hanseatic League.

In England a system of posts was maintained in the reign of Henry VIII, and was greatly developed under Elizabeth and James I. During the reign of Charles I, the rate of postage was from 2d. to 6d. for a single letter, according to distance; 8d. to Scotland; and 9d. to Ireland, a penny (d.) equaling two cents in American or Canadian currency. Various changes in the rates and in the management were made until 1840, when the present system was established. The principal new features

were the introduction of a charge by weight, a uniform rate for all distances, and prepayment. Prepayment was made easy by the use of newly devised stamps, to be attached to the letter.

The postal service of Great Britain and Northern Ireland is under the direction of the Postmaster-General, who is a member of the Privy Council and of the Cabinet. He is the only official in the department who resigns with the Cabinet, all other employees being under the civil-service regulations.

All other countries have modeled their systems to some extent on that of Great Britain. The Prussian postoffice was first established in 1646, and other German states later adopted similar plans. The basis of the existing system in Germany was the treaty of postal union with Austria in 1850. In 1871 a system was adopted by which the states retained the management of their own postal service, except that they used the same stamps and together formed an imperial postal district. Only Bavaria and Württemberg had separate issues of stamps. German postal services remain in control of the central government under the Constitution of the republic (1919).

The French postoffice dates from the year 1464, and as early as 1643 included a parcel post. The present postal system dates from 1802; postage stamps were adopted in 1849.

In the United States. The number of postage stamps sold each year in the United States is from sixteen to seventeen billion. There are over 50,000 postoffices and more than 350,000 employees. The United States postal service handles 3,000,000 letters every hour of the day and night, every day in the year. It issues and pays each day about 625,000 money orders, and registers 225,000 letters and parcels. The annual receipts average $500,000,000, or over $4 for each man, woman, and child in the country; however, the expenditure for the service is always greater than the receipts, and Congress makes appropriations to cover the deficit. The average distance traveled by pieces of mail matter is 700 miles. The entire vast system is under the control of the Postoffice Department, one of the executive departments of the government, whose head, the Postmaster-General, is a member of the President's Cabinet.

The following statistics of the Federal Postoffice, covering an average year, give an impressive showing of the volume of work accomplished, and the magnitude of the organization:

Number of employees	353,223
Number of postoffices	50,266
Letters handled per second	833
Letters handled per minute	50,000
Letters handled per hour	3,000,000
Letters handled per day	72,000,000
Letters handled per year	26,400,000,000
Stamps sold per year	16,250,000,000
Postal cards sold per year	1,800,000,000
Stamped envelopes sold per year	3,921,000,000
Number of money orders per year	195,206,657
Money-order business per year	$1,653,657,554
Depositors in the postal savings bank	402,325
Money deposited in the postal savings bank	$147,442,052
Number of rural-mail carriers	44,729
Miles rural-mail carriers travel per day	1,270,746
Mail sacks used in one year	14,000,000
Mail sacks manufactured in one year in government factory	1,250,000
Mail sacks repaired in a year.	3,000,000
Parcel-post packages handled in a year	1,136,234,319
Letters sent to Dead-Letter Office in a year	25,854,845
Packages sent to Dead-Letter Office in a year	456,713
Year's number of misdirected or illegibly directed letters returned to sender or delivered to right person	4,073,639
Year's number of packages not delivered or returned	121,780



OFFICE OF THE POSTMASTER-GENERAL Washington, D. C

Photo U & U



Photos: U & U

Where Millions of Letters Are Handled Every Year. These photographs were taken in a postoffice in a large city. Above, sorting air mail, a branch of the postal service that is expanding tremendously. Below, a revolving sorting table for letters; a revolving under-platform delivers the letters to a stacking mechanism.

Money found in such letters and packages	$113,066
Stamps found in same	$29,644
Draft checks and money orders found	$5,184,311
Amount of money that could not be returned	$40,870
Amount in stamps that could not be returned	$22,379

Development. The earliest record of a postoffice in North America appears in the general court or assembly of Massachusetts in 1639, when the house of a certain Richard Fairbanks was—

"appointed for all letters, which are brought from beyond the seas, or are to be sent thither, to be left with him, and he is to take care that they are to be delivered, or sent according to direction."

Nearly twenty years later a postal service was established in Virginia, and in 1672 a monthly post between New York and Boston was put into operation. In 1692 a royal patent vested in one Thomas Neale the right to operate an intercolonial postal service, and from this event dates the real beginning of the postoffice in America. In 1707 the Crown purchased the good-will of this private organization, and until 1775 managed the colonial service as a branch of the general postoffice in London. The development of this service is intimately associated with Benjamin Franklin, who, from 1753 to 1774, was deputy Postmaster-General for the colonies. Franklin was removed from office in the latter year because he had earned the government's displeasure by signing a petition for the removal of Governor Hutchinson of Massachusetts. The patriotic movement was then so far advanced that the colonies organized an intercolonial postal service of their own.



Photo: U & U

A VETERAN MAIL CARRIER

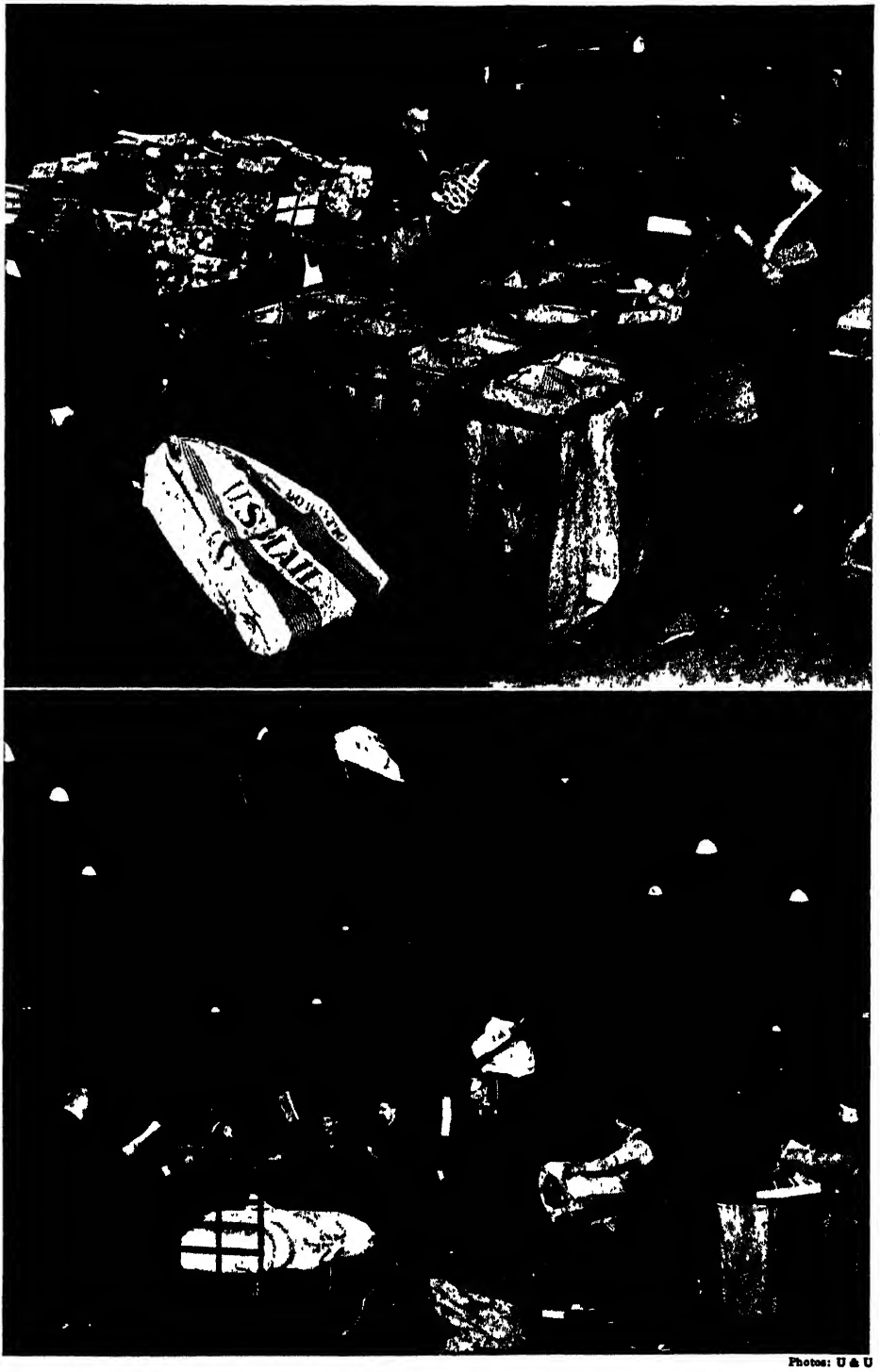
Your postman is one of the most faithful men engaged in any occupation, and it is a strict rule that he must always be pleasant and courteous

In 1775 Franklin was appointed the first Postmaster-General, with authority to establish a line of posts from Falmouth, Me., to Savannah, Ga. Since then the postoffice has developed in marvelous fashion; in 1789 there were seventy-five postoffices; the greatest number in any year was 76,945 in 1901, but this number has been gradually reduced to about 53,000 by the establishment of thousands of rural routes.

The first great advance in the system came in 1847, when the government, following the lead of Great Britain, began to use the adhesive postage stamps. Stamped envelopes were first used in 1852, and three years later the registry system was introduced. All domestic mail matter, except that sent by parcel post, may be registered at any postoffice in the United States. The government will pay an indemnity of the actual value, not to exceed $1,000 for any piece of registered mail lost in transit.

Free Delivery. Previous to 1863, all mail had to be called for at the postoffice. In that year, free delivery to street addresses in all cities having a population of 50,000 or more was undertaken. By degrees, free delivery has been extended, until now about half the population of the country is thus served. It now exists in all cities having a population of 10,000 or more, as well as in smaller towns if they show annual receipts exceeding $10,000. Free delivery is not confined to the cities and towns. It was first tried in country districts in 1896, and this branch of the service, known as rural delivery, has now grown to large proportions; there are nearly 45,000 rural-delivery routes, serving about 6,500,000 families.

Special Delivery. Since 1885 there has been provision that letters and packages may be sent by special delivery. This means that when the mail arrives at the postoffice of its destination, it is immediately given to a special messenger who carries it to the person addressed. Thus the letter or package may reach its journey's end several hours sooner than if it had been delivered by the regular letter-carrier. The charge for this service is ten cents to twenty cents, determined by weight of the package, and is paid by attaching a special-delivery stamp, or regular postage stamps to the required value, in addition to the ordinary postage. If regular postage stamps are used, to which there is no objection, *Special* or *Special Delivery* must be written on the address side of the envelope or wrapper. A similar service in Great Britain is maintained, and is called *express delivery.*



Photos: U & U

Handling Parcel Post in a Great City Postoffice. Above, sorting packages into mail sacks; such accuracy is demanded that a clerk seldom throws one package incorrectly in many thousands handled. Below, bags of mail shot down runways, to be dispatched to trains.

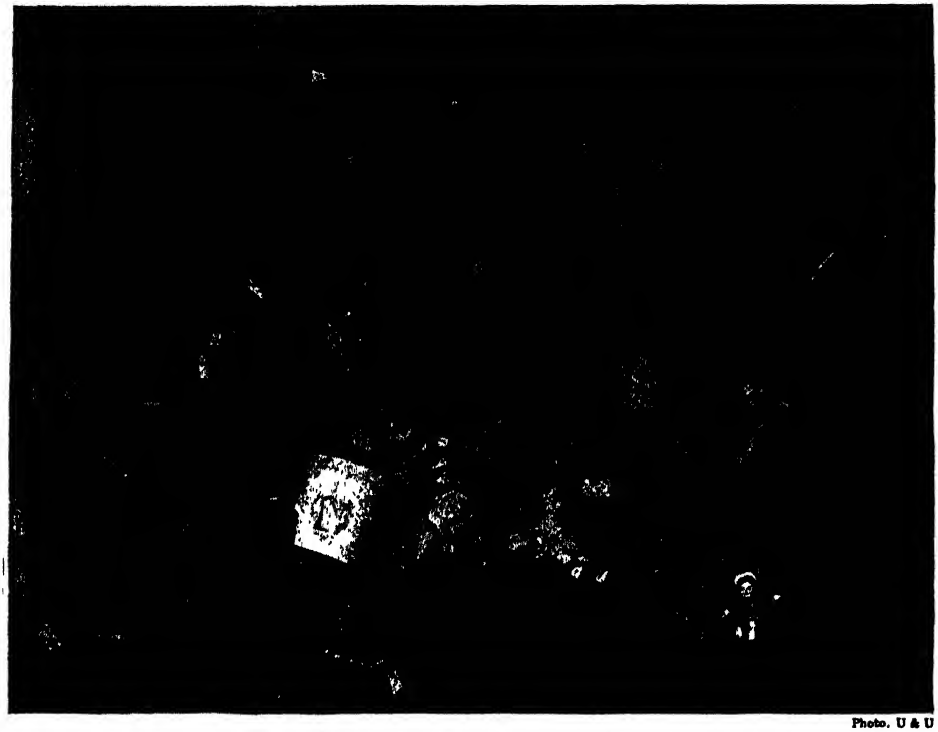


Photo. U & U

GETTING READY FOR BARGAIN HUNTERS

A room in the Dead Letter Office in Washington where is stored parcel-post mail which the Postoffice Department cannot deliver to the owners, because of faulty address or other equally good reason. Periodically, the accumulation is sold at auction. Purchasers may not open the packages offered for sale; they buy blindly, and upon later examination find they have acquired anything from a cheap toy to a valuable diamond

Money Orders. The money-order system of the Postoffice Department is described in the article MONEY ORDER.

Railway Postoffice. The backbone of the entire American system is the railway post-office, founded by George B. Armstrong in 1864. Traveling postoffices had been used in England before that time, and mail had been carried by rail in the United States as early as 1834. But after 1875, the railroads were induced to change the construction of their mail coaches so that letters and packages could be sorted on the train. This innovation has made it possible to save several hours in the delivery of each letter, for when a train arrives at its destination, all letters for points beyond are already sorted and placed in bags ready for the next outward-bound train. These traveling postoffices have also been introduced on steamships, particularly those to and from foreign ports. Each railway mail clerk is familiar with the location of 5,000 to 20,000 postoffices, and can tell instantly on what railroad each postoffice is situated, what junction points are passed to reach that office, and by what one of several possible routes a letter will most quickly reach its destination. The accuracy with which these clerks do their work is remarkable, the average error in classifying mail being only 1 in 12,000 pieces handled. One clerk established a record by sorting 17,000 cards at the rate of sixty a minute without making a mistake.

Air Mail. Any mailable matter, except that liable to damage from freezing, may be sent by air mail, including sealed parcels not exceeding fifty pounds in weight and not exceeding eighty-four inches in length and girth combined. Special air-mail stamps are issued for the payment of postage on air mail, but ordinary stamps may be used. The matter should be plainly endorsed, "Via Air Mail." Envelopes of distinctive design have been approved by the Postoffice Department, and may be used for air mail.

For the history of the establishment of air-mail service, see the article AIRCRAFT (The Air Mail).

Classes of Postoffices. The postoffices of the United States are divided into four classes, according to their annual receipts. In the first class are those whose receipts exceed $40,000 a year; the postmasters in this class receive salaries of $3,200 or over. The second class



Photo: U & U

MOTORCYCLE DELIVERY OF MAIL TO AIRPLANES

includes postoffices whose annual business amounts to from $8,000 to $35,000; these postmasters receive salaries of $2,400 to $3,000. Third-class offices have receipts from $1,500 to $8,000, and their postmasters receive from $1,100 to $2,300. Postmasters of these three classes are appointed by the President and are confirmed by the Senate. Their terms of office are nominally four years, but they are not under the civil service, and may be removed by Presidential order.

There is a fourth class of postoffices, with receipts below $1,500 a year. All fourth-class postmasters, except in Alaska and the island possessions, are now classified in the civil service, and are not subject to removal by the Postoffice Department. They receive no salaries, but are given a fixed percentage of the face value of postage stamps canceled on letters mailed at their offices. When the commissions of a fourth-class postmaster amount to $1,500, the office is raised to the third class. Three-fourths of all the postoffices in the United States are in the fourth class; these postmasters are appointed by the Postmaster-General, and not by the President.

Related Subjects. The reader is referred in these volumes to the following articles:

Banks and Banking (Postal Savings Banks)
Cabinet
Dead-Letter Office
Parcel Post
Postage and Postage Stamps
Postal Union, International

POSTOFFICE ORDER. See MONEY ORDER.

POSTULATE, *pos' tu late.* See GEOMETRY (Terms Used).

POSTURE, CORRECT. See LIFE EXTENSION.

POTASH, the commercial name for certain compounds of the element potassium (which see). Strictly speaking, the name belongs to the carbonate (potassium, carbon, and oxygen), which is chiefly used in the manufacture of glass. It was originally obtained by leaching the ashes of burned wood and boiling down the lye in large open kettles. The residue, a white solid, was called potash because it was made from *ashes* in *pots*. In some rural communities wood ashes are still leached, and the lye obtained is used in the preparation of crude soap. Commercially, potassium carbonate is prepared from the the mineral sylvite, which is nearly a pure compound of potassium and chlorine. It is one of a group of minerals found in large quantities in the salt beds of Stassfurt, Germany.

In agriculture, fertilizers containing potassium are extensively used to increase the yield

of potatoes, sweet potatoes, cotton, onions, tobacco, and other plants that give a large return per acre. The content of potassium in such fertilizers is usually stated in terms of the oxide (potassium and oxygen). The salt beds at Stassfurt were long the chief source of supply. During the World War, American sources of potassium salts were developed, in the effort to provide a substitute for German potash. Natural brines in the Western states, kelp, cement-mill dust, beet-sugar waste, and wood ashes were among the sources utilized, but after the war, fertilizer manufacturers again became dependent on supplies exported by Germany. Meanwhile, the United States Geological Survey began experiments in the Southwest, and in 1926 announced the discovery of extensive deposits of potassium salts in Southeastern New Mexico. These minerals showed higher percentages of potash (the oxide) than the general average in German deposits, and the discovery will undoubtedly break the monopoly so long held by the Stassfurt beds. At about the same time, the Russian government announced the location of immense deposits in the government of Perm, Eastern Russia. T.B.J.

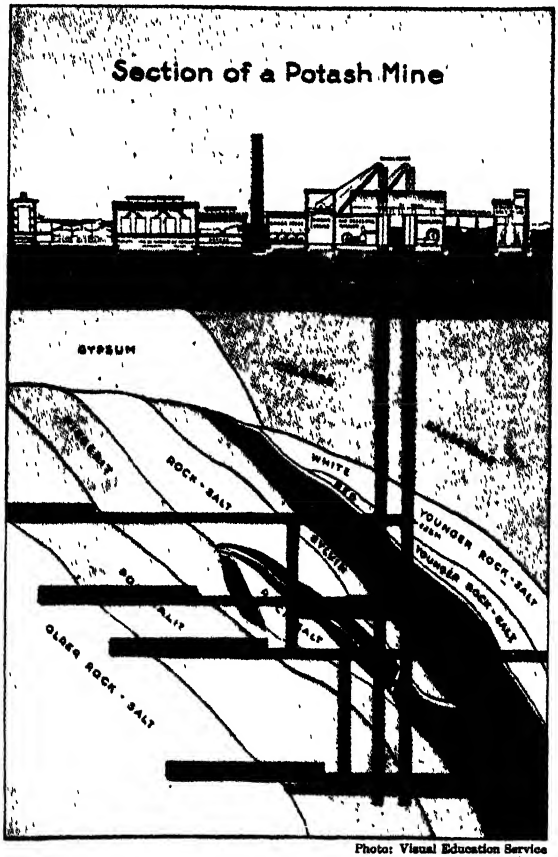


Photo: Visual Education Service

Chemical Formulas. Potassium carbonate is K_2CO_3; that is, a molecule contains two atoms of potassium (*kalium* in Latin), one atom of carbon, and three atoms of oxygen. The oxide is K_2O—two atoms of potassium and one atom of oxygen.

POTASH LYE. See CAUSTIC.

POTASSIUM, *po tas' ih um*, a soft, silvery-white metal, which, when thrown upon water, bursts into flame. Potassium is one of the chemical elements, with the symbol *K* (from the Latin form, *kalium*). It is never found free in nature, but it exists in combination with other substances in soils, in plants, and in many rocks, about two and a half per cent of the earth's crust being potassium. The best-known potassium salts are found at Stassfurt, near Magdeburg, Germany. The salts are subjected to a powerful electric current, which frees the metal from its compounds.

Pure potassium is but little used outside of chemical laboratories. It is as soft as wax and lighter than water, from which it withdraws the oxygen so rapidly that the heat generated by the chemical action sets the hydrogen on fire. Hence we say that potassium burns on water. Because of its affinity for oxygen, it has to be kept in naphtha.

Potassium is an essential element of plant food, and some of its compounds are used as fertilizer. A soil deficient in potassium will not produce good crops. Because the supply of potassium compounds was depleted during the World War, owing to the German monopoly, the United States government made special efforts to develop the home supplies (see POTASH, for details). Some potassium compounds are extensively used in the arts. The carbonate is *potash*, and the nitrate is *saltpeter*. The hydroxide, or *caustic potash*, on exposure to the air, or when dissolved in water, changes to the carbonate.

All the solutions of the foregoing compounds are strongly alkaline. Potassium cyanide is very poisonous. It is used in photography and in dyeing. The sulphate, commonly known as *plaster* is used as fertilizer. The bromide and iodide are used in medicine, and the chloride is employed in the manufacture of other potassium compounds. T.B.J.

Related Subjects. The reader is referred in these volumes to the following articles:

Alkali Caustic

Chemistry (The Elements)
Electrolysis
Fertilizer
Photography
Potash
Saltpeter

POTASSIUM BICHROMATE. See CHROMIUM.

POTASSIUM BITARTRATE, *bi tahr' trate.* See CREAM OF TARTAR.

POTASSIUM CYANIDE. See POTASSIUM.

POTASSIUM HYDROXIDE, *hi drok' side.* See CAUSTIC.

POTASSIUM NITRATE. See SALTPETER.

POTASSIUM PERMANGANATE, *pur man' gah nate.* See DISINFECTANTS.

POTASSIUM PLASTER. See POTASSIUM.

POTATO, the most popular and widely used vegetable in the world. It belongs to the same family as the nightshade, the tobacco plant, and the tomato. In every civilized country of the temperate zone, the potato crop ranks next to the cereal crop. But this has not always been the case. Until Columbus discovered America and the early explorers had carried some of the curious plants of the New World back to the Old, potatoes were unknown in Europe. They were not even known in North America until after the middle of the sixteenth century, when they were first brought to Virginia from Peru. The name "Irish" is applied to potatoes because their introduction into Ireland as a staple crop saved the people from the terrible famines that had often devastated the country, and not because they are native to the island.

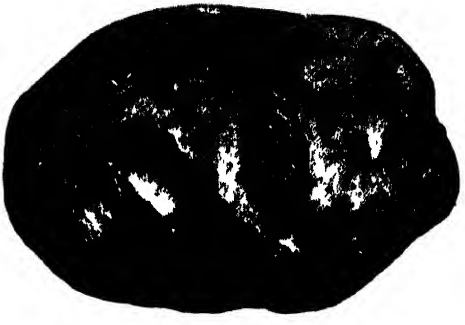
Description and Culture. The potato plant grows from one to three feet high, and bears white or purple flowers and a round, purplish fruit about as large as a gooseberry. The



HOW POTATOES APPEAR UNDERGROUND
At the left is shown the formation of the leaves.

latter is the seedball of the plant. The edible part is not the root, but a tuber, or underground stem, and the "eyes" are stem buds. New plants may be grown from seeds or from old potatoes or pieces of potatoes containing "eyes," but there is a striking difference in the results obtained. An old potato used as seed will yield the same variety of tuber over again, while the tubers of plants grown from seeds will show considerable variation from the parent stock. The Burbank potato is one of a number of varieties resulting from experimentation with seed-planting.

Potatoes do best in well-drained, sandy loam, and they respond readily to enrichment of the soil. Whether whole tubers or pieces of tuber are used as "seed," the sets should be clean, free from disease, and of vigorous quality.



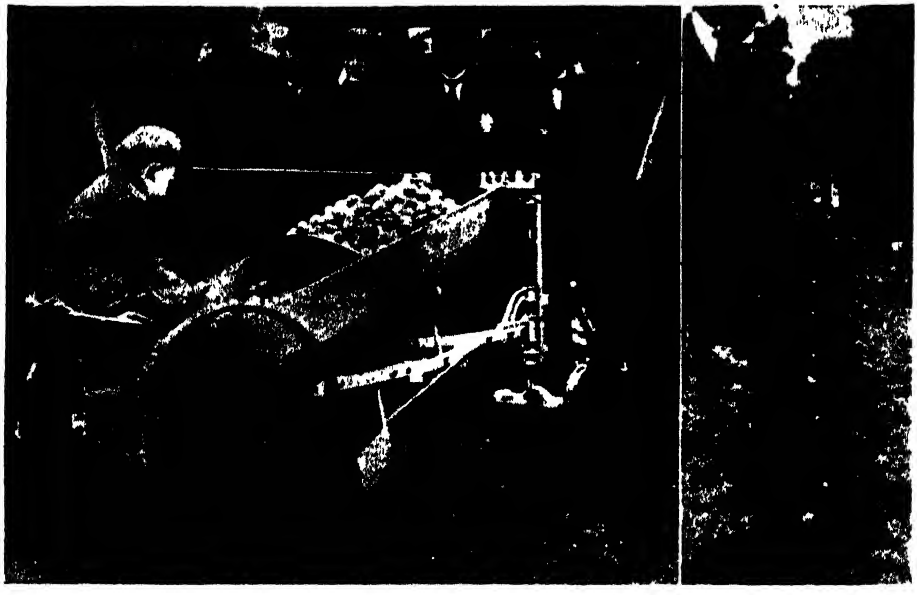
DRY ROT
Caused by late-blight fungus.

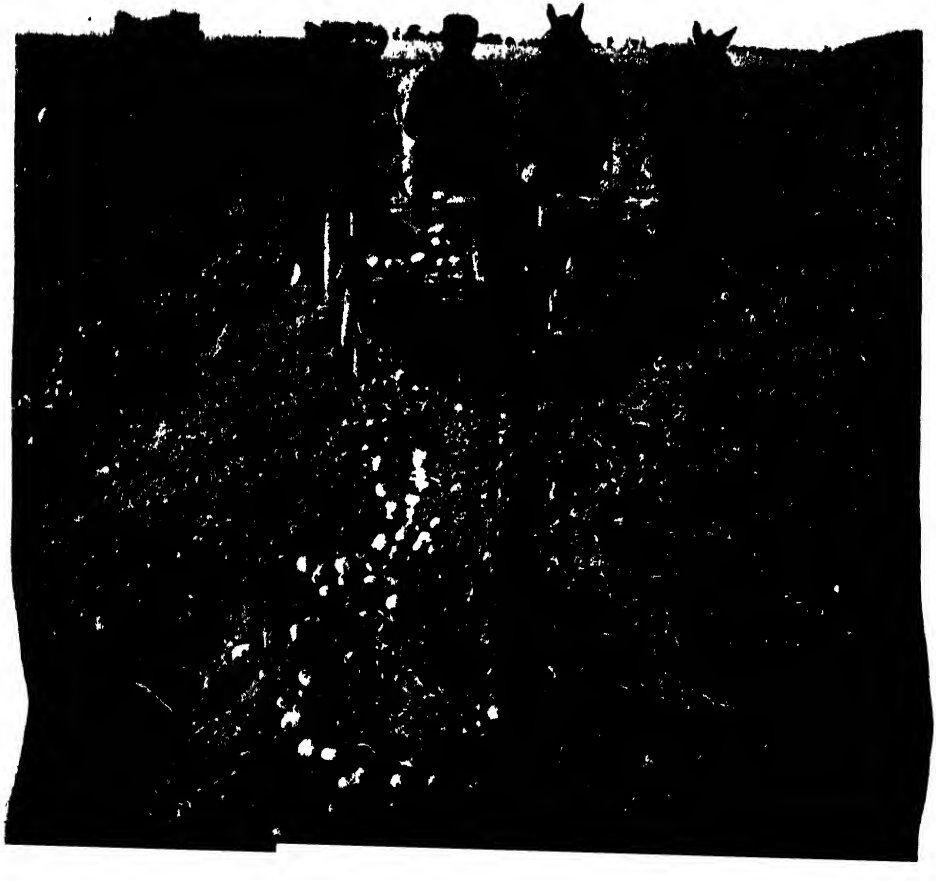
Best results are secured from cut tubers when the seed pieces are blocky in shape, have one or more well developed eyes, and weigh not less than one ounce. Pieces of tubers should be planted immediately after cutting, to prevent loss of moisture and discoloration. Cultivation to keep out the weeds should be continued until the plants have fully blossomed.

Enemies. Potatoes are subject to several forms of potato rot, or blight, which attack leaves, stems, and tubers. One of the most effective measures for checking these diseases is spraying the young plants with Bordeaux mixture. The Connecticut Experiment Station, after thirteen years of investigation, reported net gains of $15 per acre from the use of this mixture. Rotation of crops, care in selecting seed pieces, avoidance of infested soil, and soaking seed tubers in a solution of corrosive sublimate are recommended as preventive measures. The chief insect enemy is the potato bug.

In the production of seed potatoes, a system of selection and certification is now in vogue which is designed to control the increasing prevalence of mosaic, or so-called *degeneration,* diseases.

Harvesting. Harvesting may be done by hand or by means of mechanical diggers. Owners of large truck farms generally use machines drawn by horses, which harvest from four to six acres a day. The ordinary type of machine has a shovel point, which works into the ground, lifts out the rows of potatoes, and deposits them on an elevator. The latter shakes out the earth and leaves the tubers on the ground behind the machine. Various forms of





plows are also used, but these do not accomplish the same results, as they leave too many potatoes undug. Often new potatoes are dug by hand labor, as their tender skins are easily injured by use of machinery.

Production. The world's annual potato crop runs into billions of bushels. Russia and Germany produce the largest crops in Europe,

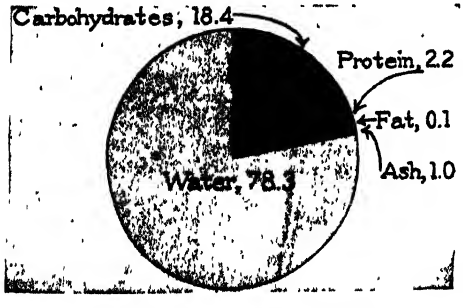


PRODUCTION ILLUSTRATED

The figures represent the average crop during five years in the United States and Canada, in the principal potato-producing areas.

with annual yields not far from a billion and a half bushels. Poland, Czechoslovakia, France, and Great Britain all raise large potato crops. The leading American states are Maine, Minnesota, New York, Wisconsin, Michigan, and Pennsylvania, the order varying from year to year. Maine, however, has one county, Aroostook, which has a higher yield per acre than any other section in the United States. In Canada, Ontario and Quebec produce about half of the total crop of the Dominion.

Food Value. Potatoes are an excellent food for supplying energy, because of their high percentage of carbohydrates, chiefly starch.



COMPOSITION OF BOILED POTATOES

As a heat producer, the potato averages 440 calories per pound. This is slightly more than many other vegetables, and it averages well with most fish The fuel value of eggs is twice as great.

Another point in their favor is the fact that nine-tenths of their nutritive content can be readily digested. About one-seventh of the food used by the average American or Canadian family consists of potato in one form or another—baked, boiled, or fried. The results of an average analysis of boiled potatoes are shown in the accompanying diagram. The fuel value (see CALORIE) is 440 calories per pound. Served with meats, which lack carbohydrates but contain a good percentage of protein, potatoes help to make a well-balanced diet. They are also valued for their content of soda and potash salts; these minerals tend to prevent acidity. Potatoes contain Vitamins B and C, which help to prevent, respectively, beriberi and scurvy (see VITAMINS).

Other Uses. Though chiefly a table food, potatoes are also employed in the manufacture of starch, and are used to a certain extent as food for farm animals. In Germany, flour used in making bread is obtained from the plant, and alcohol is also manufactured from it and used as a substitute for petrol in running motors.

Sweet potatoes (which see) belong to another family.

Potato Clubs. Not a little of the success which has attended the boys' and girls' club movement has been due to the success of these organizations in potato culture. The growing of potatoes and corn attracts the boys and a few girls, while more of the girls are particularly interested in tomatoes. These are associated activities in boys' and girls' clubs. B.M.D.

Scientific Name. The potato belongs to the family *Solanaceae* Its botanical name is *Solanum tuberosum.*

Related Subjects. The reader is referred in these volumes to the following articles

Alcohol	Insecticides and Fungicides
Boys' and Girls' Clubs	Potato Bug
Burbank, Luther	Solanum
Dare, Virginia (The Legend)	Starch

POTATO BUG, OR COLORADO, *kol o rah'-doh,* **BEETLE,** a stout yellow beetle, the most destructive of the insect pests which attack the potato plant. This beetle is about half an inch long. It may be recognized by its wing covers, on each of which there are five black stripes. The insect is supposed to have originated in Mexico. When potatoes were first cultivated in the western part of the United States, the beetle spread from its original food plant, the sand bur, and traveled from field to field, living on potato vines. In 1860 it had become troublesome in Nebraska; by 1875 it had spread to the Atlantic coast. It is now an annual pest of the potato crop.

The beetles emerge from the ground in the spring and lay their yellow eggs in clusters on the under side of the foliage; the soft-bodied orange-red larvae, after they are hatched, feed on the tender leaves. After three weeks of ravenous eating, they drop off, burrow into the ground, and emerge as full-grown insects about ten days later. There are two or three

broods a season. Paris green and lead arsenate are effective, as well as powdered mixtures dusted over the plants. Contact sprays are of little use. Among the natural enemies of potato beetles are ladybird beetles, toads, snakes, and birds. W J.S.



Photo American Fruit Growers' Journal

THE POTATO BUG

Classification. The potato bug belongs to the family *Chrysomelidae* It is classed as *Doryphora decemlineata* The name *bug* is not used in its scientific sense. See BEETLE; BUG

POTATO-BUG BIRD. See GROSBEAK.

POTATO SPIRIT, another name for fusel oil (which see).

POTAWATOMI, *pot ah wot' o mie.* See INDIANS, AMERICAN (Most Important Tribes).

POTENTIAL. See ELECTRICITY.

POTENTIAL ENERGY. See ENERGY.

POTIPHAR. See JOSEPH (A Slave in Egypt).

POTOMAC, *po toh' mak,* **RIVER.** Throughout its length of 450 miles, this picturesque river of the Eastern United States forms the boundary between Maryland on the north and east and West Virginia and Virginia on the south and west. The Potomac flows in a winding, southeast course from its headwaters in the Allegheny Mountains until it empties into Chesapeake Bay, seventy-five miles from the Atlantic Ocean. At Washington, D. C., which is 125 miles from its mouth, the river becomes a tidal stream, navigable for large ships, and for the last 100 miles, it is a magnificent estuary from two to seven miles wide.

Historic associations invest the Potomac. Where it breaks through the Blue Ridge Mountains is Harper's Ferry, memorable as the scene of John Brown's Raid. Seventeen miles below Washington, the nation's capital, Mount Vernon overlooks the river. The home of George Washington, it has become a shrine to all Americans. The spire of Christ Church, where Washington was a vestryman, may be seen from the wharf at Alexandria, Va., opposite Washington, D. C.

High above the river on its right bank lies the grave of the Unknown Soldier in Arlington National Cemetery.

Related Subjects. The reader is referred in these volumes to the following articles

Alexandria, Va	Harper's Ferry
Arlington National Cemetery	Mount Vernon

POTOSI, *po toh se'.* See BOLIVIA (The Cities).

POTSDAM. See GERMANY (Principal Cities).

POTTER, PAUL. See PAINTING

POTTER'S CLAY. See CLAY.

POTTERY. One of the arts handed down through the centuries is that of making vessels of clay. The name *ceramic,* or *keramic,* a term derived from the Greek word *keramos,* meaning *pottery,* is applied to this art, and its products are known as pottery.

How Pottery Is Made. Clay containing the proper amount of moisture can easily be worked into a plastic state that will admit of its being fashioned into any shape desired. When dried, the clay becomes hard and firm. The simplest form of pottery can be made with but few tools, and primitive peoples have always attained a good degree of skill in making earthen vessels whenever the material has been at hand. Some of the finest examples of the skill of such peoples are found in specimens of Indian pottery discovered in the pueblos in the southwestern part of the United States, and the descendants of those people to-day produce ware of rare beauty by skill of hand.

The first step in the making of pottery consists in the preparation of the material. Clay of various grades is used. That containing any appreciable amount of iron turns red when burned, whence the red color of bricks and of the coarser varieties of earthenware, such as flowerpots and crocks. Some varieties turn reddish-brown, and others cream color. But whatever the quality of the clay when it reaches the factory, it must be ground in water to a finely pulverized state. Before grinding, any hard objects, such as small stones or pebbles, are separated from it. During the grinding, fine sand, feldspar, or flint may be added. The proportions and kind of these ingredients



Photos Keystone

Steps in Pottery-Making. (1) Kneading the clay with the feet, as has been done for centuries (2) Shaping the clay on a revolving wheel (3) A picturesque kiln house (4) The oven in the kiln is tightly closed after the articles are placed within it. (5) Dipping pottery into glazing solution. 5783

are determined by the sort of ware to be made.

Vessels are fashioned by hand, in molds, and by the use of both the hand and the mold. Only a few tools are employed. The potter takes the quantity of clay necessary for the vessel he is to make, and throws it on the center of a horizontal disk called the *potter's wheel*. The wheel may be turned by a crank and pedal or by power. In either case, the speed of the wheel is easily regulated to suit the convenience of the workman. With moist hands, the workman forms the clay into shape as the wheel revolves. If a hollow vessel is desired, he forms the clay into a cone, then presses down upon the apex with his thumbs, and gradually works into the mass until by skill of hand he shapes the vessel. The finishing touches are put on with tools of wood and leather; then the vessel is placed in the drying room to harden. Revolving molds called *jiggers* are now used in all large manufactories, and they greatly increase the output. Plates and saucers are made by placing the mold for the upper side of the article on the wheel, pressing the clay down on it, and then laying over the clay the mold that forms the bottom, the molds being so adjusted that a uniform thickness is secured for each plate.

Vases and many other hollow vessels of fine ware are now shaped in molds of plaster of Paris, which are made in sections so that they can be taken apart easily This method is known as *casting*. The mold is filled with a thin mixture of water and clay and allowed to stand until a layer of clay is deposited on the sides, when the mixture is poured out. The porous plaster of Paris absorbs the water, leaving the shell of clay. When this has sufficiently hardened, the mold is taken apart.

Firing. Clay that is hardened by drying will again absorb moisture. To prevent this, it must be heated to a high temperature. After the pottery has hardened in the drying room, it is placed in cylindrical earthen cases called *saggers*, which are stacked one above the other in a kiln. The firing lasts from thirty-six to forty-two hours, and the ware is usually heated to a white heat. The style of kiln, degree of heat, and time required for firing vary for different kinds of ware. When taken from the kiln, where they have been allowed to cool slowly, the articles are known as *biscuit*.

Glazing. This process consists in coating the ware with a substance which, when fired, will give a hard, glossy finish. Various substances are used, including lead oxide, or litharge, powdered feldspar, flint, white clay, Paris white, and other substances. The glaze is ground to a very fine powder and mixed with water. This mixture, known as *slip*, is a little thicker than milk. The articles are dipped in the slip and so handled by the workman that the glaze is evenly distributed over them. The water is absorbed by the ware or evaporated, leaving a thin coating of glaze which must be fused by heat; thus a second firing is necessary. The temperature in the glazing kiln is raised very slowly, and the ware is allowed to cool slowly. The firing changes the glaze to a transparent gloss which brings out clearly any figures that may have been placed on the ware.

Color effects are produced by coloring the glaze, and a variety of colors is produced by using glazes that have



Photos Visual Education Service

ANCIENT VASES

At top, nuptial vases of the ancient Greeks; in the National Museum, Athens. Center, Hadrian's vase, from Tivoli, Italy; now in Warwick Castle, England. At bottom, the famous Portland Vase (see PORTLAND VASE).



Photos: O R O C

Cloisonné Art in China. At top, beating copper to form cloisonné ware. Center, filling in the spaces between the bent wire fillets with enamels of various hues; the wires are attached to the copper base. At bottom, final decoration, when more colors, to secure perfectly harmonious blending, are added.

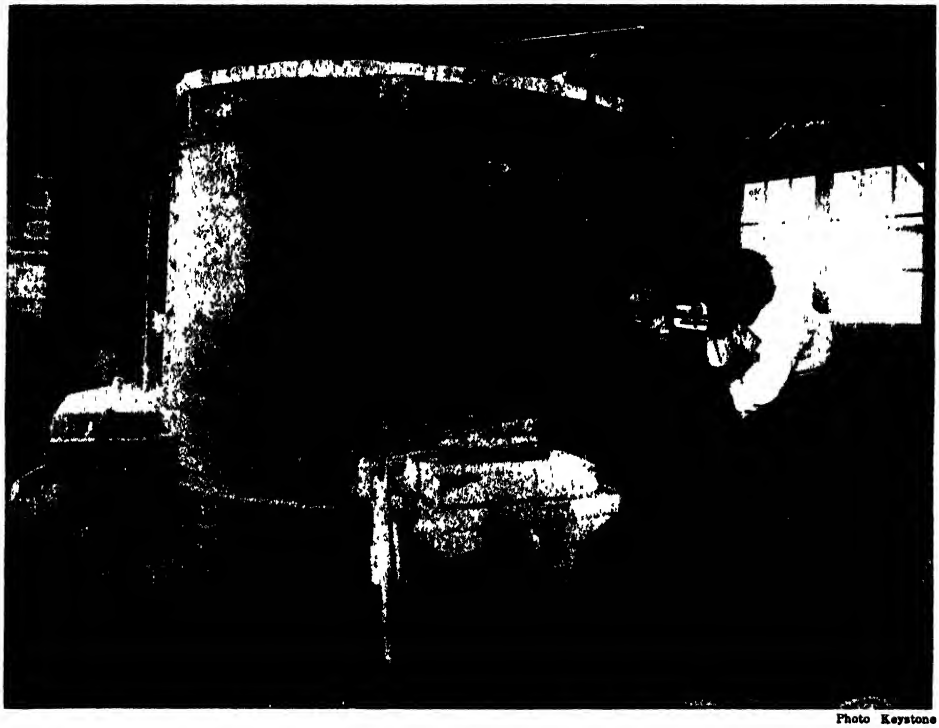


Photo Keystone

A POTTERY KILN IN A NEW YORK VILLAGE

There is a peephole, closed with a metal plug, through which the potter looks, after the firing has continued for some time He must know that all is well within the kiln.

different colors. One part of the article may be dipped in one glaze and the other part in another. Sometimes the glaze is poured on the ware in an oven, and the flow stopped by heat, producing beautiful shaded effects. Glazing is the finishing process, and when the ware comes from the glazing kiln, it is ready for the market unless decorations are to be added. These are put on by hand, either before or after glazing. In the latter case, a third firing is necessary (see CHINA PAINTING).

Varieties of Pottery. There are many varieties of pottery, but all fall within three classes:

Earthenware. This includes all the coarser grades of pottery. It is usually thick and heavy and poorly glazed, or without glazing. Jugs, crocks, and the heavier grades of ware used for cooking and table purposes are good examples. The pottery of prehistoric times and that now made by barbarous and partially civilized peoples belong to this class of ware.



Photo Visual Education Service

POTTERY-MAKING IN THE HOME

In Switzerland many peasants are engaged in making high-grade pottery.

Stoneware. This is a higher grade than earthenware, and includes most of the tableware in general use. It is made of good material, is hard and light, well enameled, and often beautifully decorated.

Porcelain, or China. This is the finest grade of pottery and likewise the most expen-

sive. Chinaware can easily be distinguished from stoneware if specimens are held up to the light. The china is translucent; that is, some light will pass through it, while no light will pass through the stoneware (see PORCELAIN).

History. Pottery-making is one of the oldest of arts, dating from prehistoric time, and discoveries of ancient pottery have enabled antiquarians of the present to judge the stage of civilization of the people by whom the articles were made. The ancient Egyptians attained a high degree of skill in making pottery, as did the Assyrians and Babylonians. The ancient Greeks claimed the invention of the potter's wheel, and they produced the most remarkable pottery of antiquity. The Romans obtained their knowledge of the art from the Greeks and the Etruscans. With the extension of the Roman Empire, the art was carried to all parts of the civilized world.

The Chinese for many centuries have excelled in the manufacture of delicate ware, and the Japanese are nearly their equals in this respect, though much of the chinaware now on the market is made in Europe and America. France, Germany, Holland, and England have each taken a prominent part in the development of modern pottery, and manufacture it on a large scale.

The manufacture of white ware was begun in America in 1685, and at the close of the Revolutionary War there were several potteries in operation. Other small works were opened from time to time, but no attempt to manufacture pottery on a large scale was made before 1825. In that year the Jersey Porcelain and Earthenware Company was incorporated and began the manufacture of pottery at Jersey City, N. J., on a much larger scale than had previously been attempted in America. Since the establishment of these works, the American pottery industry has steadily increased.

Although great quantities of pottery are still imported into the United States, its annual exports of this product are valued at hundreds of thousands of dollars. Large potteries are located on Long Island; at East Liverpool, O., and neighboring cities in Ohio, West Virginia, and Pennsylvania; at Buffalo and Syracuse, N. Y.; Trenton, N. J.; Kalamazoo, Mich.; Salt Lake City; Los Angeles and San Francisco, Calif.

Related Subjects. In connection with this subject, readers are referred in these volumes to the following articles.

China Painting	Netherlands, The (Delft)
Clay	Porcelain
Faience	Rookwood Pottery
Kaolin	Wedgwood Ware

POTTSTOWN, PA. See PENNSYLVANIA (back of map).

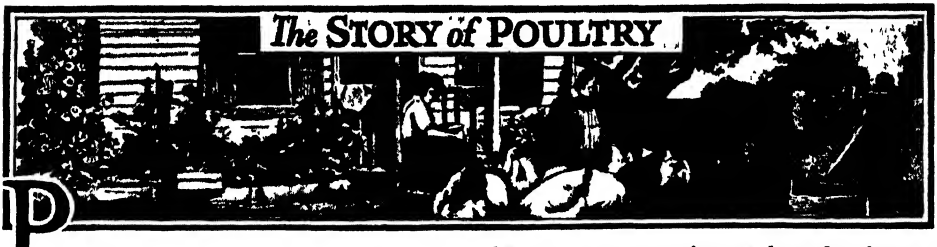
POTTSVILLE, PA. See PENNSLYVANIA (back of map).

POUCHED BEAR, a pouched mammal of Australia. See KOALA.

POUCHED DOG. See TASMANIAN WOLF.

POUCHED RAT, the name given the gopher by naturalists. See GOPHER.

POUGHKEEPSIE, *po kip' sie,* N. Y. See NEW YORK (back of map).

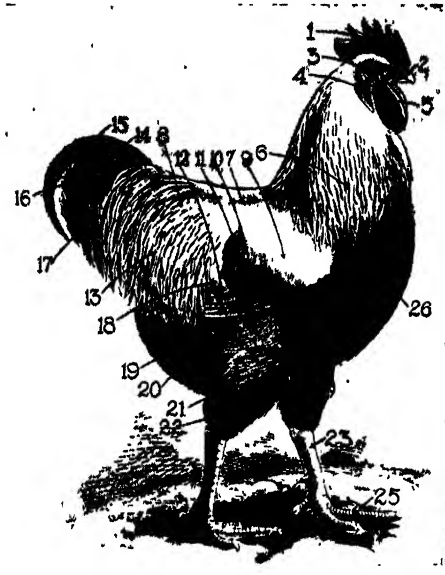


POULTRY. In a broad sense, the term poultry is applied not only to the common barnyard fowls—the cock and the hen—but to ducks, geese, turkeys, guinea fowls, and a few other domesticated birds. The rearing of the common fowl, however, has reached a place of such importance that *poultry-raising* is now practically synonymous with *chicken-raising.* Probably no branch of farm work has aroused greater interest in recent years than the poultry industry.

It has attracted many people because it affords an opportunity for an active out-of-door life, and others have taken it up because the great and increasing demand for poultry products and the high prices obtained for them seem to promise good profits from a moderate investment. The man who understands the poultry business can make more money, in proportion to the capital invested, than one who raises wheat, but everyone who undertakes to raise chickens must be prepared to work hard and perseveringly, to accept cheerfully many disappointments and failures, be content with small returns at first, and be willing to learn.

How Poultry Is Classified. A standard method of classification divides chickens into *classes, breeds,* and *varieties,* with reference to their place of origin, size and shape, and color, respectively. The following table includes the most important fowls of economic value:

CLASS	BREED	VARIETY
American	Plymouth Rock	Barred, White, Buff, Silver Penciled, Partridge.
	Wyandotte	Silver, Golden, White, Buff, Black, Partridge, Silver Penciled.
	Java	Black and Mottled
	Dominique	Rose Comb.
	Rhode Island Red	Single Comb and Rose Comb.
	Buckeye	Pea Comb.
Asiatic	Brahma	Light and Dark.
	Cochin	Buff, Partridge, White, Black.
	Langshan	Black and White
Mediterranean	Leghorn	Single-Comb Brown, Rose-Comb Brown, Single-Comb White, Rose-Comb White, Single-Comb Buff, Single-Comb Black, Silver
	Minorca	Single-Comb Black, Rose-Comb Black, Single-Comb White.
English	Dorking	White, Silver, Gray, Colored
	Redcap	Rose Comb
	Orpington	Single-Comb Buff, Single-Comb Black, Single-Comb White.



PARTS OF A FOWL EXTERIOR

(1) Comb
(2) Beak
(3) Face
(4) Ear lobe
(5) Wattles
(6) Hackle
(7) Back
(8) Saddle
(9) Wing bow
(10) Wing bar
(11) Flight coverts
(12) Primaries
(13) Saddle feathers
(14) Lesser sickles
(15) Sickles
(16) Main tail feathers
(17) Tail coverts
(18) Secondaries
(19) Fluff
(20) Body
(21) Thigh
(22) Knee joint
(23) Shank
(24) Spur
(25) Toes
(26) Breast



PARTS OF A FOWL INTERIOR

(*a*) Esophagus
(*b*) Crop
(*c*) Gizzard
(*d*, *e*) Intestines
(*g*) Rectum
(*h*) Liver
(*i*) Bladder
(*j*) Pancreas
(*k*) Heart
(*l*) Lungs
(*m*) Kidneys
(*n*) Ovaries
(*o*) Oviduct
(*p*) Spleen

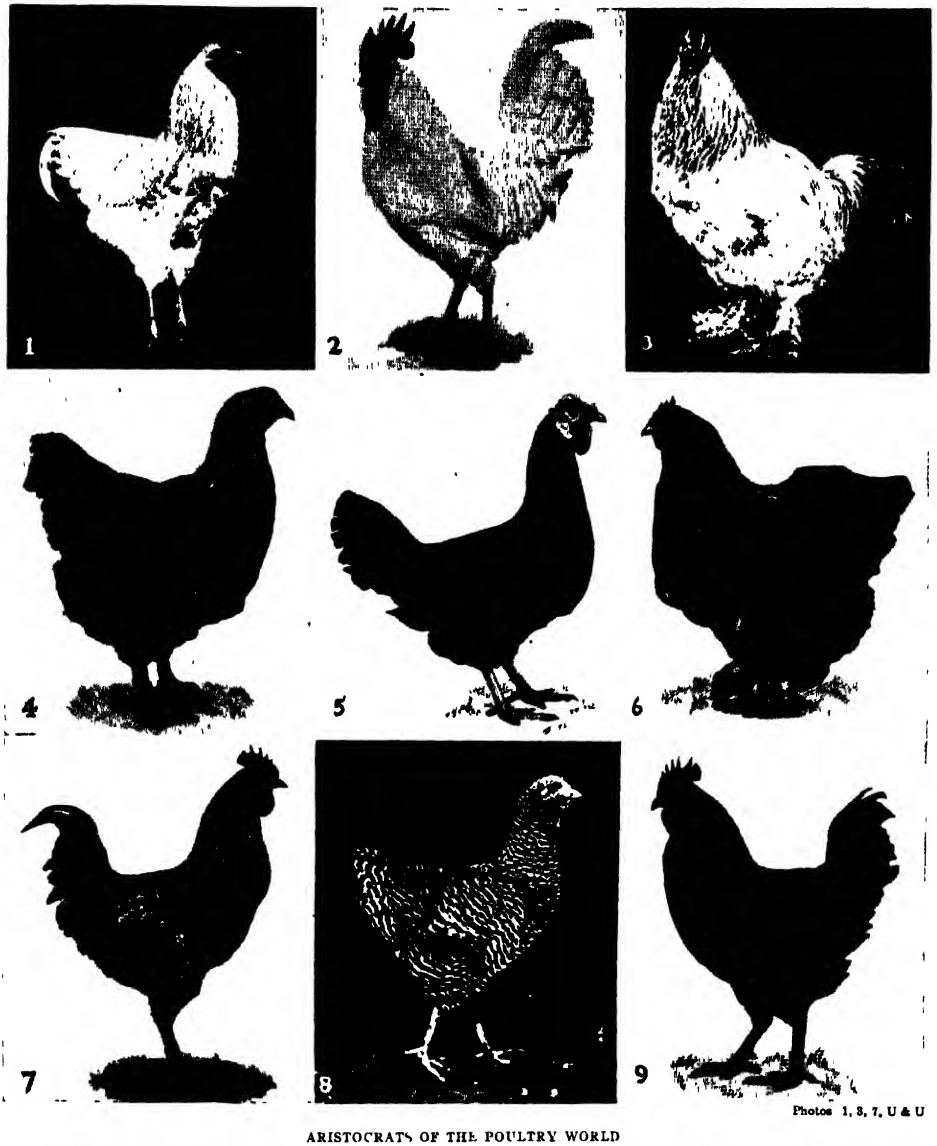
From the standpoint of utility, chickens are classified as *egg breeds*, *meat breeds*, and *general-purpose breeds*. (Fancy *breeds*, including the bantam fowls, are reared only for peculiarities of appearance, and need not be considered here.)

It should be remembered, however, that hard and fast distinctions cannot be set up in this method of classification, for there is wide variation in the qualities of individuals within the same breed. At the same time, the following general statements as to characteristics may be made:

Chickens belonging to the egg-breed group are small and active, mature early, have good foraging habits, are disinclined to brood, and are sensitive to cold Examples are Leghorns and Minorcas

The meat breeds include chickens of large size, slow movements, poor foraging habits, and poor laying qualities; they are gentle in disposition, persistent brooders, and mature late. Examples are Brahmas, Cochins, and Langshans

General-purpose fowls are of medium size, produce a fair number of eggs, are good table birds, and good brooders and mothers. They are more active than meat fowls and less active than the egg-layers Examples are Plymouth Rocks, Wyandottes, and Rhode Island Reds.



Photos 1, 3, 7, U & U

ARISTOCRATS OF THE POULTRY WORLD

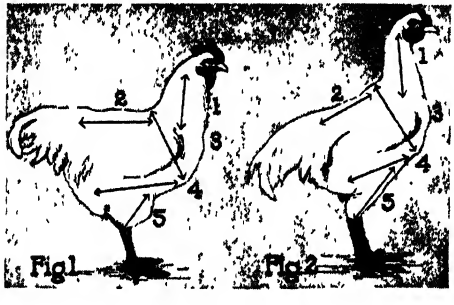
(1) White Plymouth Rock cock (2) White Leghorn cock (3) Light Brahma cock (4) Dark Brahma hen (5) Black Minorca hen (6) Buff Cochin hen (7) Barred Plymouth Rock cock. (8) Plymouth Rock hen (9) Buff Plymouth Rock cock

Care of Poultry. Chickens cannot thrive on wet land, so the plot selected for their range should have good, natural drainage. Accumulations of mud can be prevented by spreading sand or gravel on the ground. Chickens should have plenty of room in which to run about, for they require exercise; if the business is conducted on a general farm where it is not advisable to give them free range, they should be provided with fenced-in yards of reasonable size. Housing is a matter of first importance. Elaborate design and costly fittings are not essential, but convenience and provision for cleanliness and ventilation are prime requisites. The henhouse should be warm in winter and cool in summer, provided with good roosting facilities, and so constructed as to prevent the entrance of rats, vermin, and other chicken pests. Overcrowding of poultry, especially of the little chickens, should always be avoided. Specific suggestions as to size, material, and plan of construction may be found in the nu-

merous poultry books, bulletins, and journals continually published.

Chickens should not be fed in a haphazard manner, for it has been definitely proved that the eggs as well as the meat are affected by the food. Egg-layers should be fed a mixed diet of grain, animal food, and green matter, and should also be supplied with lime and other mineral matters that enter into the composition of eggshells. Grit for helping to digest the food and an abundance of pure water are no less important. Though corn is the standard grain for fattening fowls, wheat and oats are essential for egg-layers. In general, egg-layers should have a diet in which the ratio of protein to carbohydrates and fat is one to four or five.

Breeding and Hatching. Poultry-raisers are now giving much attention to the subject of breeding, as they know that the success of the business depends upon the elimination of the weakling and the propagation of strong, vigorous fowls. The important points of difference between a fowl of weak constitution and a vigorous one are shown in the accompanying diagram. Within recent years, the science of



HOW TO JUDGE FOWLS

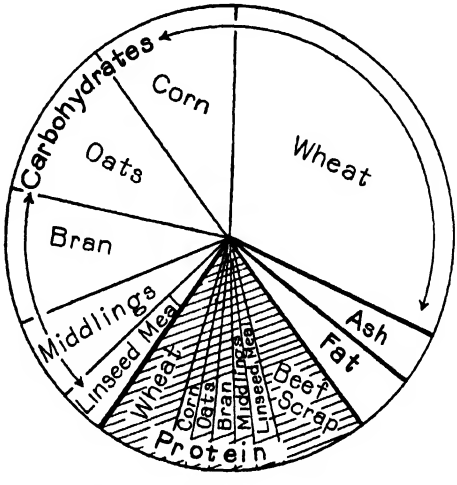
Fig 1 shows a bird of good conformation Compare neck (1), back (2), and keel (4) with corresponding parts in Fig 2 This bird has good depth (3), medium length of leg (5) and a plump breast Fig 2 shows a bird of weak constitution and a poor breeder The neck (1) is too long and slender, the back (2) and keel (4) are too short, the leg (5) is too long, and the breast (3) is too shallow

artificial hatching has been brought to a high degree of excellence. This subject is treated elsewhere in these volumes, under the heading INCUBATOR.

Food Values. Chicken meat is universally esteemed for its delightful flavor. Another point in its favor is its attractive appearance, for chicken "looks good to eat," whether broiled, fried, roasted, or stewed. As it is easily digested, it is an excellent food, both for healthy persons and for invalids The meat of young chickens, called *broilers*, has less fat in its composition than that of older fowls, but it is considered more delicate in flavor. The average composition of broilers and fowls is as follows:

CLASS	REFUSE	WATER	PROTEIN	FAT	ASH
Broilers	41 6	43 7	12 6	1 4	7
Fowls	25 0	47 1	14 0	12 3	7

Broilers have a fuel value of 289 calories (see CALORIE) per pound; fowls, of 751 calories. C.F.C.



AN EGG-LAYER'S BALANCED RATION

Related Subjects. The reader is referred in these volumes to the following articles

Cookery	Goose
Duck	Guinea Fowl
Egg	Incubator
Food Products, Preservation of	Nutrition
Fowl	Pheasant
	Turkey

POUND, a unit of weight for measuring many commodities There are three denominations—*apothecaries'*, *avoirdupois*, and *troy*. The pound avoirdupois contains 7,000 grains, or 0.4536 kilogram, and is divided into sixteen ounces. The troy and apothecaries' pounds contain 5,760 grains each, or 0 3732 kilogram, and are divided into twelve ounces (see table in the article DENOMINATE NUMBERS) The grain is the basis of computation in all three denominations, and does not itself vary. The troy pound is used for weighing precious metals, the avoirdupois for heavier merchandise.

The *pound sterling*, the highest denomination used in British money accounts, is equal to twenty shillings. It is equivalent, when at par, to $4 8665 in United States money The pound sterling received its name from originally being equal to a quantity of silver weighing one pound. See MONEY (Foreign Monetary Standards).

POUND, the name of a place or enclosure maintained by a town or city wherein may be

kept stray animals until they may be called for or otherwise disposed of. The word undoubtedly is derived from the verb *impound*, meaning *to shut up*. The keeper of a pound is called *poundmaster*.

POUNDAGE. See TARIFF.

POUNDAL. See FOOT-POUND; DYNE

POUND STERLING. See POUND.

POUSSIN, NICOLAS (1594?-1665), a great French painter, originator of the classic element in French art Contrary to the wishes of his parents, he preferred to execute designs rather than to study Latin, and his desire to become an artist led him to Rome He studied with sculptors and painters, acquired a knowledge of anatomy from surgeons, and became familiar with landscapes through wandering about the countryside Perhaps the most valuable part of his art education was through his admission to the studio of Domenichino. He married the daughter of a countryman who had nursed him through a severe illness



Photo Brown Bros

POUSSIN

Little by little his fame increased, and he became first painter to the king, through the friendship of the great Richelieu Among his greatest paintings was the *Labor of Hercules*, which is a treasure of the Louvre That gallery possesses nearly forty other examples of his art, more than twenty are in Madrid, and others are in nearly every great gallery of Europe

POUTRINCOURT, *poo traN koor'*, JEAN DE BIENCOURT, Baron de (1557-1615), a French colonizer, one of the founders of Acadia He was a wealthy nobleman of Picardy, who came to Canada in 1603 in the company of the Sieur de Monts, and a year later was given the grant of Port Royal Instead of building up his colony, he devoted most of his energies to trading with the Indians In 1606 he fortified Port Royal, but immediately left it to join Champlain on an exploring expedition which reached the site of the present town of Chatham, Ont His colony finally fell into the hands of the English, who abandoned it in 1614. Poutrincourt, who had been in France since 1612, returned to Acadia for a few months, but a year later was killed in battle in France See CHAMPLAIN, SAMUEL DE; MONTS, SIEUR DE.

POVERTY. See PAUPERISM.

POWDER. See GUNPOWDER.

POWDERLY, *pow' der li*, TERENCE VINCENT (1849-1924), an American labor leader and social investigator, born at Carbondale, Pa. At about fourteen years of age, he began work in a machine shop and was a mechanic for the next thirteen years. He was elected mayor of Scranton, Pa , on the Labor ticket, in 1878, 1880, and 1882, and was Commissioner-General of Immigration of the United States from 1897 to 1902. In 1906 he was appointed special representative of the Department of Commerce and Labor to investigate the reasons for the heavy immigration from Europe, and in 1907 became chief of the Division of Information in the Bureau of Immigration As a student of economic and social conditions throughout the world, he became recognized as an authority, for his observation and experience among laborers seldom were equaled. His book, *Thirty Years of Labor: 1859-1889*, is a valuable review of the industrial tendencies of the period it covers

POWDERY MILDEW. See GRAPE (Methods of Culture), MILDEW.

POWELL, *pou' el*, JOHN WESLEY (1835-1902), an American geologist and explorer, known especially for his valuable surveys of the Colorado River regions. After completing his education at Oberlin College, in Ohio, he spent several years in research work in natural history and geology On the outbreak of the War of Secession, he enlisted as a private, saw much active service, and was promoted to the rank of major. After the conclusion of peace, he became professor of geology in Illinois Wesleyan University at Bloomington, and in 1867 accepted the chair of geology at the Illinois Normal University In the following summer he began a series of surveys that made him famous One result of his work was the organization of the United States Geological Survey, of which he was director from 1881 to 1894



Photo Brown Bros.

JOHN WESLEY POWELL

Writings. Powell's *Contributions to North American Ethnology* is a report of the investigations made by him for the Smithsonian Institution on the subject of the American Indian Other publications include *Exploration of the Colorado River of the West and its Tributaries*, *Canyons of the Colorado*, and *Introduction to the Study of Indian Languages*

POWELL, MAUD (1868-1920), an American violinist, born at Peru, Ill. She was educated

in the public schools of that city, and from 1881 to 1885 studied the violin in Chicago, Leipzig, Berlin, and Paris. In 1885 she made her first public appearance in Berlin, and within the next five years gained the reputation of being the greatest woman violinist of her time. Her work as a soloist with such orchestras as those of Thomas, Seidl, Nikisch, and Damrosch proved that no requirements of technique, volume, or tone were too difficult for her, while her frequent tours of America, Europe, Asia, South Africa, and Australia did not impair the freshness and inspiring character of her playing. It has frequently been declared that she introduced more new violin music to the public than any other musician in America. Much of her work has been preserved on phonograph records. In 1904 she married H. Godfrey Turner of London.



Photo Brown Bros.

MAUD POWELL

POWELL, WILLIAM, painter of the *Battle of Lake Erie.* See page 2287.

POWER, in arithmetic and algebra, the result obtained when a quantity is multiplied by itself a specified number of times. The second power, or square of a number, is found by multiplying the number by itself once; the product obtained by taking a number three times as a factor is the third power; four times, the fourth power, and so on. Thus, the second power of 6 (written 6^2) $= 6 \times 6$, or 36, while the third power (written 6^3) $= 6 \times 6 \times 6 = 216$. The degree of the power, or the number of times the given quantity is taken as a factor, is expressed by a number called the *exponent*, which is written to the right and above the quantity, as 6^3, 3 being the exponent. The process of finding a power of a number is called *involution* (which see). For power, in physics, see MECHANICAL POWERS. J.W.Y.

POWER OF ATTORNEY, a legal instrument authorizing the person named in it to act as the agent or the attorney for the one who signs it. If the power of attorney is to be recorded, it must be attested by a notary public. A *general* power of attorney authorizes the agent or attorney to act for the principal without limitation. A *special* power limits him to the act or acts specified in the instrument. Courts place close construction upon the power of attorney, requiring the agent to keep strictly within the limits of the instrument. The death of the principal revokes the power of attorney. See AGENT.

General Form of Power of Attorney

Know all Men by These Presents, That I, John Ward of Kansas City, County of Jackson, and State of Missouri, have made, constituted, and appointed and by these presents do make, constitute, and appoint, Joseph King my true and lawful attorney for me and in my name, place, and stead (*here state the purpose for which the power is given*), giving and granting unto my said attorney full power and authority to do and perform all and every act and thing whatsoever requisite and necessary to be done in and about the premises, as fully to all intents and purposes as I might or could do if personally present, with all power of substitution and revocation, hereby satisfying and confirming all that my said attorney or his substitute shall lawfully do or cause to be done by virtue thereof

In witness whereof, I have hereunto set my hand and seal the third day of March, one thousand nine hundred thirty-eight

JOHN WARD (Seal)

Signed, sealed, and delivered
in presence of

HOWARD JOHNSON,
Notary Public

POWERS, HIRAM (1805-1873), an American sculptor, born at Woodstock, Vt. After years of struggle, he was enabled to realize his ambition to study in Italy. He removed to Florence in 1837, where he remained for the rest of his life. A touch of tender melancholy is discernible in his *Eve Disconsolate,* the *Last of the Tribe,* and the *Greek Slave.* The last-named, his best-known work, of which he made



Photo. Brown Bros.

HIRAM POWERS AT WORK

six replicas, is noted for its purity of treatment and beauty of form. *The Fisher Boy*, *Proserpine*, and *Il Penseroso* are the titles of other sculptural pieces which won him recognition at home and abroad. He executed also busts and statues of many eminent Americans, including Franklin, Washington, Webster, Longfellow, Calhoun, and Sheridan. There are many examples of his work in American museums. The Corcoran Gallery in Washington has a replica of his *Greek Slave*; the Metropolitan Museum of New York his *Fisher Boy*; and the Cincinnati Museum his *Eve Disconsolate*. See SCULPTURE (United States).

POWHATAN, *pow ah tan'* (about 1550-1618), an Indian chief who figures in the romantic story of John Smith and Pocahontas. Powhatan, whose real name was *Wahunsonacook*, was the sachem of a confederacy of Algonquian tribes, also known as Powhatan. It is said that he exercised authority over thirty tribes before his death, and that his domain in Virginia extended southward 300 miles from the James River and 200 miles inland from the seacoast. This chief was a combination of shrewdness, executive ability, and cruelty, and demanded implicit obedience from his subjects.

Historians doubt the authenticity of the tale, but John Smith tells in his story of Jamestown that Powhatan was about to kill him when the chief's daughter Pocahontas successfully interceded, saving the white man's life. Two years later, in 1609, Smith crowned Powhatan emperor of the Indies, but needed supplies hoped for from the Indians in return for this honor were not granted, and Smith then tried to capture him. Powhatan thereafter hoped for the destruction of the English, and was active against them until Pocahontas married John Rolfe in 1614. After that event he was always friendly, and he frequently supplied the settlers with food. See POCAHONTAS; SMITH, JOHN; illustration, page 5794.

POYNINGS, SIR EDWARD. See IRELAND (History: Relation of the Two Islands).

PRAETOR, *pre' tor*, one of the most important magistrates in the ancient republic of Rome. Originally, the name was but a title of honor borne by the consuls, but when, in 367 B.C., the plebeians were given rights to the consulship, the patricians demanded that they be allowed to appoint the new officers from their own number. To this new magistrate, who was called *praetor*, was given the judicial part of the duties of the consuls. When the praetorship assumed greater importance, the plebeians demanded that they be given the right of holding the office, and gained this privilege in 337 B.C. About 227 B.C., the number of praetors was increased to four; at a later date there were as many as eighteen. A praetor held office for a year, and at the close of his term was usually sent as governor to a province. Roman law is said to have been greatly indebted to the edicts of the successive praetors.

Related Subjects. The office of praetor will be better understood if the following articles in these volumes are consulted:

Consul Patrician Plebeians

PRAETORIAN, *pre toh' ri an*, **GUARD**, the personal guard of the Roman emperors, consisting of picked men from the legions. Augustus made of the praetorians a standing army consisting of nine cohorts of 1,000 men each, three cohorts being kept in Rome, the others in near-by cities. Under Tiberius, the cohorts were given a permanent camp in the city, and under Vitellius their number was increased to sixteen. Members received double the pay of the regular soldiers, were held to be equal in rank to the centurions of the legions, and at the close of their sixteen-year terms were given a liberal reward. The praetorians acquired dangerous power, which they exercised unscrupulously, appointing and deposing emperors at will. It became absolutely necessary for a would-be emperor to win their favor by bribery, or to buy it after his election. The Praetorian Guard was abolished in A.D. 312 by Constantine.

PRAGMATIC SANCTION, *prag mat' ik sangk' shun*, a translation of the term *sanctio pragmatica*. In medieval and later European history, this was applied to a solemn decree having the force of a fundamental law. Of several pragmatic sanctions, the one of greatest importance was that issued by Emperor Charles VI, in 1713. This is usually referred to by historians as the Pragmatic Sanction. Charles, who was Holy Roman Emperor, had no male heirs, and so issued a decree settling his possessions on his daughter, Maria Theresa (which see). Though several of the great powers agreed to observe this decree, they broke their pledges after Charles's death. Maria Theresa's efforts to maintain her rights resulted in the War of the Austrian Succession (see SUCCESSION WARS).

PRAGMATISM, *prag' mah tiz'm*, a theory in philosophy that the meaning of concepts is to be sought in their practical consequences. The term was first used in print in 1898 by William James in his treatise entitled *Theoretical Conceptions and Practical Results*. James is said to have derived the idea from an essay by Charles Peirce on *How to Make Our Ideas Clear*, published in 1878. The test of an idea, according to Peirce, was to examine the consequences which it produces in action. This simple and practical rule was used by James to test all the prevailing theories in philosophy, and it led to new definitions and a new outlook. It changed the view of truth as an objective relation, and made it correlative with human



From the painting by Nahlig

Powhatan Yields to the Entreaties of Pocahontas. The artist presents an imaginative picture of the incident when the life of Captain John Smith was saved by the daughter of the chieftain. The canvas may be as authentic as the story. (See POWHATAN, page 5793.)

judgment and human needs. That is, there is no such thing as abstract truth independent of all human associations. "Truth is one species of good, and not, as is usually supposed, a category distinct from good, and coördinate with it. The true is the name of whatever proves itself to be good in the way of belief." See JAMES, WILLIAM; PHILOSOPHY.

A full exposition of this theory will be found in James's book, *Pragmatism*, printed in 1907, and in the writings of John Dewey and F. C. S. Schiller. Recent philosophy has been greatly influenced by pragmatism, and the theory has aroused considerable popular interest. In *The Story of Philosophy*, Will Durant makes the following comment:

> What James meant to do . . . was to dispel the cobwebs that had entangled philosophy; he wished to reiterate in a new and startling way the old English attitude towards theory and ideology He was but carrying on the work of Bacon in turning the face of philosophy once more towards the inescapable world of things He will be remembered for this empirical emphasis, this new realism, rather than for his theory of truth . .

PRAGUE, *prayg*, OR **PRAHA**, *prah' hah* (Czech), the former capital of Bohemia, is now the capital of the republic of Czechoslovakia. It is situated 150 miles northwest of Vienna, at the base and on the slopes of hills which skirt both sides of the picturesque Moldau River, here spanned by tower-guarded bridges. Its commercial importance is enhanced by its situation on this navigable waterway and its position at the junction of seven railroads.

The city is divided into several districts, the most interesting of which is the Altstadt (Old Town), on the right bank of the river. There are numerous public gardens in the suburbs, and several royal parks are in the vicinity. Everywhere are to be found statues, tablets, and historical relics. Among the points of special interest are the town hall, the new Czech National Theater, the old Jewish graveyard, the Czernin Palace, now used as a barracks, and an imposing Renaissance structure containing a picture gallery, conservatory of music, and industrial art museum.

Among the city's many churches are the domed Jesuit church of Saint Nicholas; the Teyn (Old Hussite) Church; and the Kreuzherren Church, constructed after the plan of Saint Peter's at Rome. The bishop of Prague is Patriarch of the new Czechoslovak National Church. In addition to the famous University of Prague, the educational institutions include the Royal German and Royal Bohemian Polytechnic institutes.

The industrial establishments are numerous and varied, and include factories for the manufacture of railway cars, leather, cotton goods, gloves, chemicals, flour, and beer, and printing and publishing houses. The city is an important sugar market, and center of trade for local manufactures. New projects include the construction of belt lines around the city, and electrification of all lines within a radius of about forty miles. Prague is also being developed as an aviation center for Central Europe.

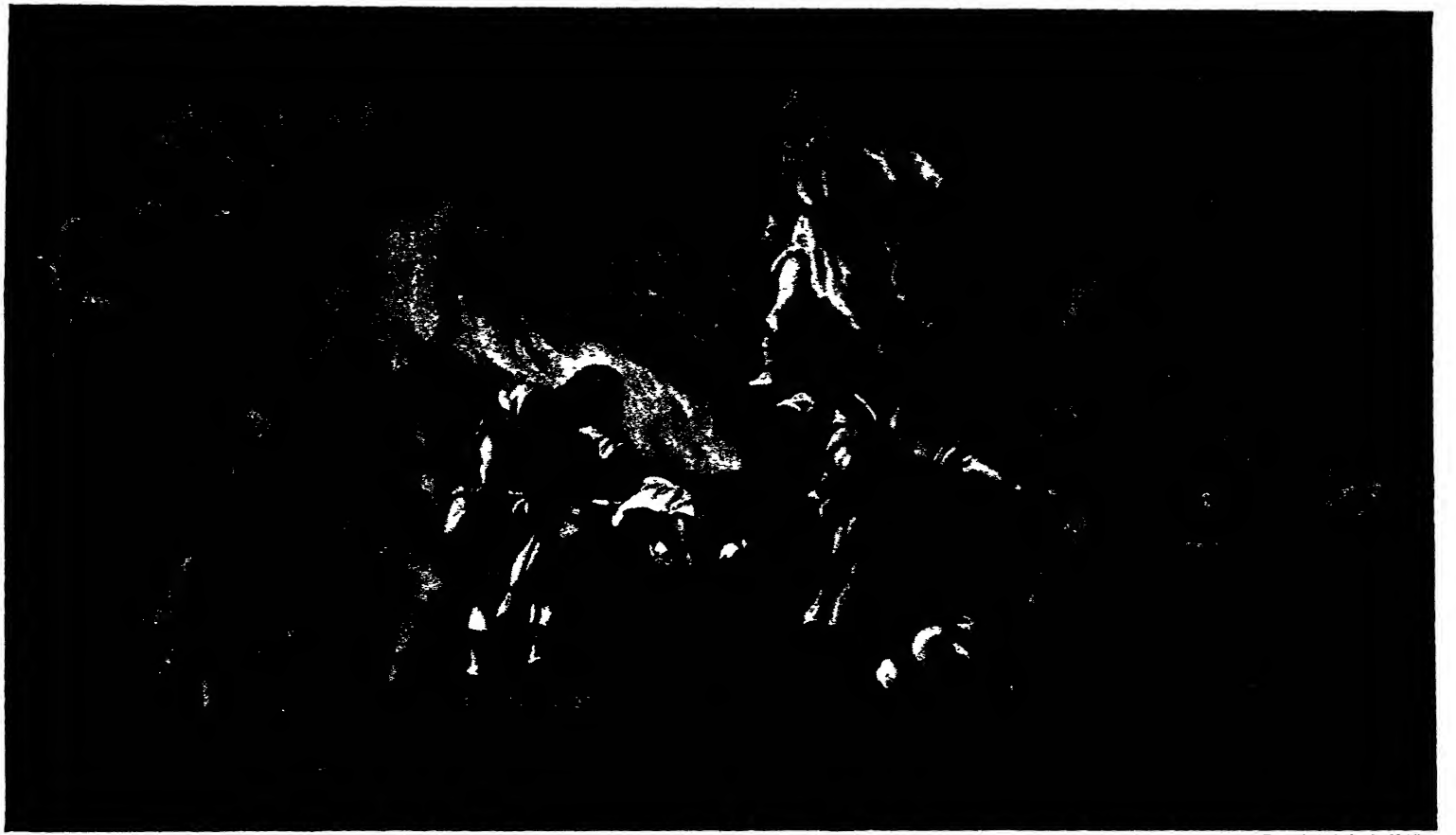
Prague is supposed to have been founded by German settlers about 1100. In the fifteenth century it was captured and almost destroyed by the Hussites, but was rapidly rebuilt. Up to the time of the fall of Napoleon, the city suffered from the troubles in which the House of Austria was involved, but since then has grown rapidly and prospered. Population, 680,000. See CZECHOSLOVAKIA.

PRAIA, *pri' ah*. See CAPE VERDE ISLANDS.

PRAIRIE, *pra' rie*, a term applied most frequently in the United States and Canada to the broad, grass-covered lands lying in the region of the Mississippi and Ohio valleys, and in the provinces of the Dominion east of the mountains, where the land is gently rolling and often almost treeless. Illinois has been nicknamed the "Prairie State," but all the territory in Western Ohio, Indiana, Illinois, Missouri, Iowa, and Wisconsin in the United States, and in the Canadian provinces of Alberta, Saskatchewan, and Manitoba, is included in the wide expanse, which is continued by the Great Plains to the base of the Rocky Mountains. The surface of the prairie section is not so level as that on the plains, for low hills and shallow river valleys often relieve the monotony of the landscape. The prairie region lies from 300 to 1,500 feet above sea level, and sandstone and limestone deposits underlie the heavy, rich soil, which is admirably suited to the growth of cereals. See PLAIN; PLATEAU. R.H.W.

PRAIRIE CHICKEN. See GROUSE, subhead.

PRAIRIE DOG, a member of the ground-squirrel family, once common on the plains of Western North America, from Canada south into Mexico. The animal is strong and well built, about a foot in length, and is covered with coarse, gray-brown hair. It has small, beady eyes, pouched cheeks, and a short, flat tail. Prairie dogs live in colonies in underground burrows, in the digging of which they show much ingenuity. About the entrance is thrown up a mound of earth which prevents water from running into the home in time of heavy rainfall. The animal then digs a steep tunnel sometimes running downward for twelve feet or more. Next it burrows a gallery on a horizontal plane, occasionally making a room for the storage of fodder or the accommodation of the family. When the food at hand is exhausted, a new entrance is made, nearer the base of supplies. Formerly, these rodents were attacked by various birds and beasts of prey,



From the painting by Noblig

Powhatan Yields to the Entreaties of Pocahontas. The artist presents an imaginative picture of the incident when the life of Captain John Smith was saved by the daughter of the chieftain. The canvas may be as authentic as the story. (See POWHATAN, page 5793.)

judgment and human needs. That is, there is no such thing as abstract truth independent of all human associations. "Truth is one species of good, and not, as is usually supposed, a category distinct from good, and coördinate with it. The true is the name of whatever proves itself to be good in the way of belief." See JAMES, WILLIAM; PHILOSOPHY.

A full exposition of this theory will be found in James's book, *Pragmatism*, printed in 1907, and in the writings of John Dewey and F. C. S. Schiller. Recent philosophy has been greatly influenced by pragmatism, and the theory has aroused considerable popular interest. In *The Story of Philosophy*, Will Durant makes the following comment:

> What James meant to do . . was to dispel the cobwebs that had entangled philosophy; he wished to reiterate in a new and startling way the old English attitude towards theory and ideology He was but carrying on the work of Bacon in turning the face of philosophy once more towards the inescapable world of things He will be remembered for this empirical emphasis, this new realism, rather than for his theory of truth.

PRAGUE, *prayg,* OR **PRAHA,** *prah' hah* (Czech), the former capital of Bohemia, is now the capital of the republic of Czechoslovakia. It is situated 150 miles northwest of Vienna, at the base and on the slopes of hills which skirt both sides of the picturesque Moldau River, here spanned by tower-guarded bridges. Its commercial importance is enhanced by its situation on this navigable waterway and its position at the junction of seven railroads.

The city is divided into several districts, the most interesting of which is the Altstadt (Old Town), on the right bank of the river. There are numerous public gardens in the suburbs, and several royal parks are in the vicinity. Everywhere are to be found statues, tablets, and historical relics. Among the points of special interest are the town hall, the new Czech National Theater, the old Jewish graveyard, the Czernin Palace, now used as a barracks, and an imposing Renaissance structure containing a picture gallery, conservatory of music, and industrial art museum.

Among the city's many churches are the domed Jesuit church of Saint Nicholas; the Teyn (Old Hussite) Church; and the Kreuzherren Church, constructed after the plan of Saint Peter's at Rome. The bishop of Prague is Patriarch of the new Czechoslovak National Church. In addition to the famous University of Prague, the educational institutions include the Royal German and Royal Bohemian Polytechnic institutes.

The industrial establishments are numerous and varied, and include factories for the manufacture of railway cars, leather, cotton goods, gloves, chemicals, flour, and beer, and printing and publishing houses. The city is an important sugar market, and center of trade for local manufactures. New projects include the construction of belt lines around the city, and electrification of all lines within a radius of about forty miles. Prague is also being developed as an aviation center for Central Europe.

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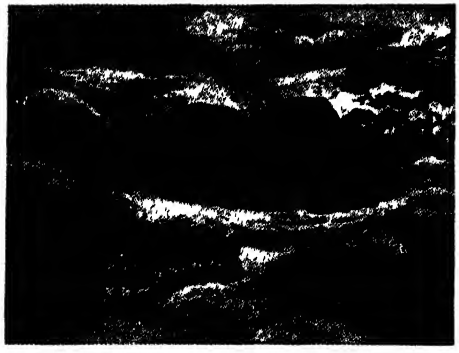
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but the diminishing of their natural enemies led to their increase until they became a serious pest to Western farmers. They are especially fond of alfalfa and grain. Efforts are being made to exterminate them, and millions are being killed through poison bait and the fumes of carbon bisulphide. W.N.H.



GOOD MORNING!
The prairie dog beholds the world from his doorway on a morning after a snowstorm

Scientific Name. Prairie dogs belong to the family *Sciuridae*. The specific name is *Cynomys ludovicianus*.

PRAIRIE SCHOONER. See KANSAS (History).

PRAIRIE PROVINCES, a name given to the Canadian provinces of Manitoba, Alberta, and Saskatchewan.

PRAIRIE SQUIRREL. See GOPHER.

PRAISE-GOD BAREBONE. See BAREBONES PARLIAMENT.

PRASEODYMIUM, *pray se od im' ih um.* See CHEMISTRY (The Elements).

PRATT INSTITUTE. See NEW YORK (Education).

PRAXITELES, *prak sit' il eez,* one of the greatest Greek sculptors of the fourth century B.C. With his less famous contemporary, Scopas, Praxiteles led the later Attic School, so called to distinguish it from the earlier Attic School of Phidias. Very little is known of the life of Praxiteles, except that he was a citizen of Athens and that he was at the height of his career about 350 B.C. Most of his principal works have perished. He excelled in the portrayal of the human form, especially the female figure, and is said to have established the type for Eros and the Satyr, conceiving them in new forms of youth and beauty. He also gave a new conception of the beauty of Aphrodite in his statues of this goddess at Cnidus, Cos, and other places. It has been said that he "rendered into stone the moods of the soul."

Among other notable works of Praxiteles are numerous statues of *Apollo*, the finest representing him as the python slayer; *Hermes Carrying Dionysus*, found at Olympia in 1877; and the group *Niobe and Her Children*, now in Florence, which some authorities attribute to Scopas. The *Hermes* group is the only one which is known to be an original. All of the others attributed to him are copies. The gods and goddesses of Praxiteles were ideal figures of earthly loveliness, and his art replaced the more heroic conceptions of the school of Phidias, which preceded him. See PHIDIAS; SCULPTURE (Greece).

PRAYER, a receptive attitude of mind in which one seeks to put himself in touch with God, usually with the expectation of petitioning the Divine Being, or of giving thanks for blessings already possessed. The attitude of the body in kneeling is merely an expression of humility and homage. There are those who conduct their prayers on their knees, others in a sitting posture, while still others stand. Victor Hugo very aptly said, "There are moments when the soul is kneeling, no matter what the attitude of the body may be." The attitude toward the subject of prayer differs somewhat with one's creed and church.

Prayer Book, a collection of prayers in printed form to be used in public and private worship. Although such a book is used in a number of churches, the name has taken on a special application, meaning the one used in the Church of England and the Episcopal Church in America. It corresponds in part to the Roman Breviary, the Missal, the Pontifical, and the Manual of the medieval English Church. Out of the Reformation came a reformed prayer book, which sought to rid the services of superstitions and to introduce more readings from the Scriptures in a language understood by the people, instead of in Latin. The English Prayer Book is said to be written in the most beautiful English prose that may be found in any book excepting the Bible itself. Its prayers date back for many centuries, and they perhaps express every human need of "all sorts and conditions" of men.

PRAYER RUG. See CARPETS AND RUGS.

PRAYING HORSE. See PROTECTIVE COLORATION.

PRAYING MANTIS. See MANTIS.

PREACHING FRIARS, a name once generally applied to the Dominicans. See DOMINICANS; FRIAR.

PREACHER BIRD. See VIREO.

PRE-CAMBRIAN, *kam' brih an,* **TIME.** See AZOIC ERA.

PRECESSION, *pre sesh' un.* See NUTATION.

PRECESSION OF THE EQUINOXES, *e' kwih nok ses,* a term used in astronomy to describe the motion of the equinoxes, the points at which the celestial equator and the ecliptic intersect. The attraction of the moon and sun on the equatorial ring of the earth causes the earth's equator, and therefore the celestial equator, gradually to change its position with

reference to the ecliptic. The effect is to produce a movement of the points of intersection of these two circles. This motion is not uniform, and for convenience it is analyzed into two parts. The uniform part is called the *luni-solar* precession, and is a westward movement of the vernal equinox amounting to 50.4″ per year; the variable part is made up of several parts called nutations. At the time, there is another similar, but much smaller, effect produced by the attraction of the planets, called *planetary* precession, which causes a change in the position of the ecliptic, and would cause the equinoxes to move eastward. The combined effects of these two movements is called the *general* precession, and is a westward motion of the equinoxes amounting to 50 3″ per year. At that rate it will take about 25,800 years for the vernal equinox to complete the circuit of the ecliptic.

Because of this movement, the celestial pole of the equator traces a small circle among the stars in the same period, 25,800 years, and thus different stars successively become polestars. The celestial pole is now approaching the present polestar, and within the next century, will pass it at a distance of about one-half degree. About 4,000 years ago, the celestial pole was near the star Alpha Draconis, which was then the polestar, and a few thousand years hence, Alpha Cephei will play that rôle In about 12,000 years, the brilliant star Vega will probably be considered the polestar, although the pole's approach to that star will not be so close.

As an effect of precession, the signs of the zodiac no longer correspond to the constellations from which they derived their names Thus, the "first of Aries," or vernal equinox, is now in the constellation Pisces, and is moving on toward the constellation Aquarius, and so on. F B.L.

Related Subjects. The following articles in these volumes should be consulted

Ecliptic	Equinox	Nutation
Equator	Gravitation	Zodiac

PRECIOUS METALS, a term applied to gold, silver, and platinum, also sometimes, though rarely, to mercury.

PRECIOUS, *presh' us,* **STONES.** See GEMS.

PREDESTINATION, the doctrine of Christian theology which asserts that everything that happens has been ordered by God from the beginning of time, and that man is powerless to avert it. The narrower meaning, and the meaning with which the world is generally associated, is that certain people, called the *elect,* are by Divine will foreordained (predestined) to salvation (election); while, on the other hand, certain others are predestined to everlasting punishment (reprobation). Saint Augustine was the first theologian to make this latter interpretation of the New Testament, and he was followed by Aquinas in the Scholastic Period. Its strongest advocate in modern times has been Calvin (See CALVIN, JOHN).

In its essence, predestination is opposed to free will, meaning man's power, helped by Divine grace, to *deserve* salvation through virtuous conduct. It is this difficulty in reconciling human freedom with predestination that has made it the subject of so much dispute. At the present day, it receives almost no support. Even the Presbyterian Church, which is an outgrowth of Calvinism, has now so modified its creed as practically to discard the predestination doctrine, making it plain that God's love and forgiveness extend to all mankind, and that no one is denied salvation except through his own unrepented sin. See FREE WILL.

Derivation. The word *predestination* is from the Latin, and means *determined beforehand.*

PREËMPTION, *pre emp' shun,* literally a *buying before,* is the name given to a method formerly used in the United States whereby private citizens could secure title to public lands Under this system, a citizen was required to file an application for the land he wanted, not to exceed 160 acres, improve it, and live on it for six months. At the end of that time, he was permitted to buy the land for $1.25 an acre. The term preëmption was applied to this system because the settler, by filing his claim and living on the land, secured the privilege of buying the land before anybody else could take it. Every person over twenty-one years of age, except a married woman whose husband was supporting her, provided he or she was a citizen of the United States or had declared intention to become one, could preëmpt a claim. A person who already owned 320 acres of land, or had abandoned his residence to take up new land in the same state or territory, was not entitled to the privilege of preëmption.

The preëmption system was established in 1837, and with minor changes in regulations, survived until 1891. Under its terms about 200,000,000 acres were transferred from the public domain to private ownership. After the War of Secession, there was considerable fraud in preëmptions, notably by land companies, who took advantage of the short term of residence required to make hundreds of applications through "dummy" settlers. The dummies remained on the land for six months, and then turned it over to the companies. The system eventually acquired an evil reputation and was abolished by Congress.

A similar system, but more limited in scope, is in use in Canada. See HOMESTEAD LAWS; LANDS, PUBLIC.

PREFECT, *pre' fekt.* See DEPARTMENT; FRANCE (Government).

PREFECT OF MORALS. See CENSORS.

PREHISTORIC AGE. See CIVILIZATION.

PREHISTORIC ANIMALS. See DINOSAURIA.

PREMIER, *pre' mih ur* (commonly, *premeer'*), the head of the Cabinet in Great Britain and other members of the British Commonwealth of Nations. His official title is Prime Minister. The corresponding official in France and in most other European countries having constitutional governments also bears the title Premier; the head of the German Cabinet is called the Chancellor. The Premier, as chief of the Cabinet, is responsible to the legislative body, or Parliament, and holds office only so long as the party he represents is in power. In case of defeat of the government on any important legislative matter, the Premier retires, with his Cabinet, and the leader of the opposition party succeeds him as Premier, by invitation of the sovereign or President. In Canada and other self-governing units of the British Commonwealth, the Governor-General has the appointive power, as he bears the same relation to his local government as the English king does to the government of Great Britain.

The Premier must be a member of Parliament, and he is directly responsible to the legislative body and to the people. There is no Premier in the United States government, though the Secretary of State, as first member of the President's Cabinet, is sometimes erroneously referred to as the Premier.

Related Subjects. The reader is referred in these volumes to the following articles.

British Empire, and British Commonwealth of Nations
Cabinet
Governor-General
Great Britain (Government)
Parliament

PREMIUM. See INSURANCE.

PREPOSITION, *prep o zish' un*, a part of speech which does the work of a connective or "relation word," in that it indicates the relation existing between its object and some other word in the sentence. "A word that looks backward as well as forward," is the way in which one grammarian speaks of the preposition, because the antecedent is no less necessary than the object for the complete expression of the thought.

Among the long list of simple prepositions in common use may be mentioned *at*, *by*, *against*, *above*, *on*, *upon*, *from*, *without*, *under*, *over*, *in*, *through*, and *during*; and among the phrase prepositions, such expressions as *according to*, *on account of*, *corresponding to*, *by means of*, *by way of*, *for the sake of*, *instead of*, and the like.

The Object of a Preposition. The noun or pronoun which forms the object of a preposition is always in the objective case, except in the idiom known as the "double possessive," where the possessive form follows the preposition *of*; as "Our Art Institute boasts several paintings *of Millet's*"; "I have a strong admiration for that cousin *of yours*."

The word governed by the preposition, however, is not necessarily a noun or a pronoun, and for this reason many grammarians prefer to refer to it as a *consequent* rather than an object. Sometimes it is an adjective or an adverb, as in the phrases *on high* and *from afar*; sometimes an infinitive or a participle, as in *except to say* and *satisfied with toiling*; sometimes a phrase, as in the expression *from of old*; sometimes a clause, as in the sentence *He turned to where they stood waiting*.

Importance and Variety. The preposition was not always so important a member of the word family as it is to-day. In the earlier history of the English language, the "possessive in *s*" was employed by good writers in constructions where modern usage insists upon indicating the relation by means of the preposition *of*. For instance, it was not considered incorrect to speak of "the house's roof," though now we say "the roof of the house," reserving the inflected form as a general thing for cases of actual possession; as *the child's toys*, and other like phrases.

The importance of prepositions has been increased by the extraordinary variety and flexibility of meaning they have come to acquire as the language has developed. The ordinary relations denoted are those of time, direction, position, cause, agency, purpose, manner, exclusion, separation, and so on; but a single preposition may denote a number of these different relations, depending upon the way in which it is used. The common prepositions *for* and *of* have at least ten distinct meanings, and others have almost as varied an application. It is this subtle power of the preposition to express different shades of meaning that makes its mastery so difficult a matter for the foreigner.

The Appropriate Preposition. Just as the same preposition assumes a different significance according to the word with which it is associated, so the same word expresses various meanings as it is combined with different prepositions.

For instance, an expert judge of silks compares one piece of satin *with* another as to texture, sheen, or wearing qualities, and then admiringly compares one or both of them *to* the lustrous, pearly lining of a seashell. A child is introduced *to* her teacher and *into* a new environment when she is sent to school; a Congressman introduces an anti-smoke bill *in* the legislature—*into* conveying the idea of entrance or motion to a more marked degree than *in*. A man may be impatient *with* his servant; he grows impatient *at* a delay in trains, and becomes increasingly impatient *under* the disappointment, because he is impatient *for* the arrival of a friend.

The Question of Order. Not so many years ago, every student of English grammar was solemnly warned *never* to let a preposition constitute the last word of the sentence. It was argued that for two reasons "a preposition is a bad thing to end a sentence *with*"—to quote the schoolboy's version of the rule: first, because it ought logically to precede its object; and, second, because it is too insignificant a word to occupy the prominent position at the end. However, if this rule is consistently applied, regardless of ease, directness, and idiom, it frequently creates constructions that not only sound stilted, but are lacking in force; as when we turn the vigorous, everyday idiom, "What did you come *for*?" into "*For* what did you come?" The same is true in the case of such expressions as, "The plan was enthusiastically agreed *to*," "I have no materials to work *with*," "This is a charming setting for our play to be given *in*," and the like.

As a general rule, it is more harmonious to place the preposition before its object, but there is no reason why such a rule should be blindly enforced in contradiction to the idiom of the language.

Common Errors. Only a comparatively few of the cases of misused prepositions we meet in the hurried, careless talk of every day can be touched upon in the following list. Unfortunately, there are few cut-and-dried rules that can be formulated for the guidance of the student.

This is between you and I, for *This is between you and me* According to rule, the object of a preposition is in the objective case, in the case of a compound object, the rule naturally covers both elements This is an exceedingly common mistake and one which, strange to say, abounds particularly in the speech of those who pride themselves on their respect for the rules of grammar Omit the object immediately following the preposition, and the mistake becomes plain as daylight, for no one would think of saying *between I*.

For what town are you bound for now? for *What town are you bound for now?* or *For what town are you bound now?* We must avoid duplicating the preposition.

He went for to find his sister, for *He went to find his sister. For to* was formerly in good use, but *for* is now considered redundant.

He jumped in the lake, for *He jumped into the lake. Into* must always be employed when there is the idea of entrance or insertion. If a boy were bathing in the lake and jumped up and down to keep warm, for instance, it would be entirely correct to speak of his jumping *in* the lake, but if we wish to convey the thought of plunging, we must make use of *into*. The same distinction is made between *on* and *upon*.

I cannot come without my sister is invited also, for *I cannot come unless my sister is invited also*, or *I cannot come without my sister*—though the latter form does not express the precise idea. *Without* is a preposition and positively must not be used to do the work of the conjunction *unless*.

We picked these cherries off of the tree near the gate, for *We picked these cherries off the tree near the gate. Of* is always superfluous after *off*. The preposition is likewise unnecessary in the commonly heard phrases, *follow after, ponder over, add on, crave for, examine into*, etc.

The poles were set with ten feet between each, for *The poles were set with ten feet between each two*. Between—from *by twain*—always implies the idea of *two*, whereas *each* is singular in force. Another common expression is *Between each act*, in place of *between acts*.

Divide this candy between the three of you, for *Divide this candy among the three of you*. Since *between* signifies *two*, it cannot properly be used when the reference is to more than two persons or things or more than two groups—as in the phrases *between the two families, between the French and English armies*.

The house looks different than what I expected, for *The house looks different from what I expected*. Avoid both *different to* and *different than*

There is no use in wasting, for *There is no use of wasing*. It is *use of*, never *use in* This is one of the most common errors.

PRE-RAPHAELITES, *pre raf' a el ites*, a group of English writers and painters who sought to express in their work and to restore to art the simplicity, sincerity, and spirituality that had characterized the painters before the time of Raphael. To this end they founded, in 1848, the Pre-Raphaelite Brotherhood, and for a time published an organ, *The Germ*, for the statement of their ideas. The leading spirit in the movement was Dante Gabriel Rossetti (which see). Other prominent Pre-Raphaelites were Rossetti's brother, William Michael, and the painters John Everett Millais (which see) and William Holman Hunt. Their ideas had the warm sympathy of such influential men as John Ruskin, Edward Burne-Jones, and William Morris. Because the movement brought back to English painting the spiritual and poetic qualities it had lost, it had far-reaching influence, which is felt even to-day. See PAINTING, illustrations, page 5800.

PRESBYTERIAN CHURCH, a Protestant denomination, so called because its local bodies are governed by *presbyters*, or elders. The pastors, together with the elders, who are elected by the congregations, are entrusted with the spiritual oversight of their churches, while the deacons manage the financial affairs and look after the poor. The pastor and elders constitute a *session*, which is under control of a *presbytery* composed of the ministers and one or more elders from each church in a given district. The presbyteries combine to form a *synod*, which is often a representative body consisting of ministers and elders chosen from the presbyteries; in other cases, all members of the presbyteries belong to the synod. Controlling all is the General Assembly, to which appeals and complaints may be carried from the lower bodies when it meets, once a year. In the United States, appeals from the synods to the General Assembly are limited to cases involving doctrine and government. Presbyterian doctrine, in general, is strongly Cal-



Genius of the Pre-Raphaelites. At left, *Pot of Basil*, by Holman Hunt. Center, *Summer*, and right, *Winter*, both by Burne-Jones. (See PRE-RAPHAELITES.)

vinistic. The controlling idea is the absolute sovereignty of God, and the supreme standard of belief is the Holy Bible. The sole requirement for membership is a credible profession of faith in Jesus Christ, and of obedience to Him.

The form of worship is simple. Pastors exercise no priestly functions, and only two sacraments—baptism and the Lord's Supper—are observed. Scripture-reading, prayer, singing of hymns, and preaching constitute the usual service.

History. At the time of the Reformation, in the sixteenth century, John Calvin organized the Reformed Church at Geneva, Switzerland, under the plan of government which is now used in the Presbyterian Church. Thus he has been considered the founder of Presbyterianism, although the Waldenses (which see) had a similar system of government four centuries earlier. In 1557 some of the most powerful barons in Scotland bound themselves by a solemn "Covenant" to overthrow all attempts to crush Protestantism, which had been introduced into their country by John Knox (which see), and three years later, the Reformed doctrine was formally recognized by the Scottish Parliament. Ultimately, the Scottish Presbyterian Church became the United Free Church of Scotland. The earliest Presbyterian churches in America were established during the first half of the seventeenth century. Between 1670 and 1690, the movement was greatly strengthened by the arrival of Scottish colonists, and in 1706 the first presbytery was organized in Philadelphia. Gradually, the denomination broadened its field, until at present there are about 17,500,000 Presbyterians in the world in all branches of the Church.

There are nine branches of the Church in America, the two largest being the Northern and the Southern, which separated at the time of the War of Secession; another large branch, known as the Cumberland, was formed in 1810, adopting the Westminster Confession of Faith, which all Presbyterians follow, but making various changes. In 1906 the Cumberland Presbyterians united with the main body, the Northern branch, known officially as the Presbyterian Church in the United States of America. The United Presbyterian Church of North America is distinguished by the fact that only Psalms are sung at religious services.

PRESBYTERY. See PRESBYTERIAN CHURCH.

PRESCOTT, ARIZ. See ARIZONA (back of map).

PRESCOTT, WILLIAM HICKLING (1796-1859), an American historian, grandson of William Prescott of Revolutionary fame, who commanded at the Battle of Bunker Hill. William H. was born in Salem, Mass., and educated at Harvard, from which he was graduated at the age of eighteen. Because of the loss of one eye by an accidental injury while he was in college, and the partial loss of the other through overwork, he was obliged to give up the study of law, and it was only under tremendous difficulties that he wrote his great works. The different parts of these, when taken together, constitute a history of Spain in its relations to America and to the Reformation. He gathered his material from all possible sources, but he had to acquire it through the eyes of a reader. He did his writing by using a specially designed frame.



WILLIAM H. PRESCOTT

In his own day, Prescott's histories were received with the greatest enthusiasm, and they still rank as classics, in spite of the author's tendency to idealize his heroes and to give a too romantic touch to his descriptions of Indian civilization. Prescott's chief merits as an historian are his breadth of view and the accuracy of his information. With Motley and Parkman, he ranks among the greatest of American historians.

Prescott's Books. His most brilliant series is a *History of the Conquest of Mexico*, on which he spent six years. His other books include *The Conquest of Peru* and the *History of the Reign of Ferdinand and Isabella*. He was working on the third volume of a *History of the Reign of Philip II* when a stroke of apoplexy caused his death

PRESCRIPTIONS consist of written directions given by a physician to a chemist for the compounding of drugs, or for medicines already prepared, to be used by a patient. It is customary to write prescriptions in Latin, or to use abbreviations of Latin words, doubtless as a protection to the public from promiscuous use of drugs. A prescription is usually preceded by the printed letter R, with an oblique line running through it (℞). This originally resembled the figure 4; it indicated the sign of Jupiter, and was placed upon the ancient prescription as a propitiation to the god Jupiter, with the hope that the mixture would prove beneficial.

PRESERVATIVES. See ADULTERATION OF FOODSTUFFS AND CLOTHING (Preservatives).

PRESIDENTIAL ELECTORS. See ELECTORAL COLLEGE.

PRESIDENTIAL RANGE. See NEW HAMPSHIRE (The Land); WHITE MOUNTAINS.

PRESIDENTIAL SUCCESSION ACT. Every American knows that if the President of the United States does not complete his

term of office he is succeeded by the Vice-President, but how many know what would happen if the Vice-President should also resign, or, having succeeded to the Presidential office, die during the period of his administration? During the first decade of the Union no one knew, for the Constitution said nothing about it, and no laws had been passed to provide for such an emergency. In 1792 Congress ruled that the temporary President of the Senate and the Speaker of the House of Representatives should be next in succession to the Vice-President, and it was nearly a century before the law was changed so that a President's temporary successors would be those more fitted to carry out his policies. Under this law of 1886, the succession is in the following order:

Secretary of State
Secretary of the Treasury
Secretary of War
Attorney-General
Postmaster-General
Secretary of the Navy
Secretary of the Interior

The offices of Secretary of Agriculture, Secretary of Commerce, and Secretary of Labor did not exist in 1886, so the holders of them are not in the list of possible Presidents by succession. That member of the Cabinet who may be called upon to assume the office of Chief Executive must, if Congress is not in session, summon it to meet within twenty days to provide for a Presidential election. No member of the Cabinet who is in the succession named above may succeed to the Presidency under the act of 1886 if he is not a natural-born citizen of the United States, or if he is not at least thirty-five years of age. In such dilemma, the choice would pass to the next eligible Cabinet member. See CABINET.



HOME *of the* PRESIDENT

PRESIDENT OF THE UNITED STATES, the chief executive officer of the United States government. He is the only official who is directly responsible to the whole nation. The Secretary of State and the heads of the other executive departments are responsible to him, and only indirectly to the people. A member of Congress, on the other hand, is responsible primarily to the state or district which he serves. The unique character of the President's position has made him one of the most powerful rulers in the world. He not only has far-reaching authority, but has the added influence of the moral effect which those powers confer.

Who May Be President. The qualifications for President are few; they are fixed by the Constitution. He must be a native-born citizen of the United States; he must be not less than thirty-five years of age, and must be a resident of the United States for fourteen years preceding his election. The youngest President ever elected was Roosevelt, who was not quite forty-three when he succeeded to the Presidency on the death of McKinley, and was only forty-six when he was elected to that office to succeed himself. William Henry Harrison, the oldest President, was sixty-eight when he was inaugurated. The Constitution further requires the President, before entering on the duties of his office, to swear (or affirm) that he will faithfully perform the duties of the office, and that he will, to the best of his ability, preserve, protect, and defend the Constitution of the United States. A President is eligible to reelection any number of times, but no one has served more than two terms, thus observing the precedent set by Washington. It is noteworthy, however, that determined efforts were made to elect Grant, Roosevelt, and Coolidge to what many people considered as third terms.

How a President Is Elected. The machinery for electing a President is simple. The candidates are nominated by the political parties in national conventions, and one of them is chosen by "electors," who have been previously named

(Continued on page 5806.)

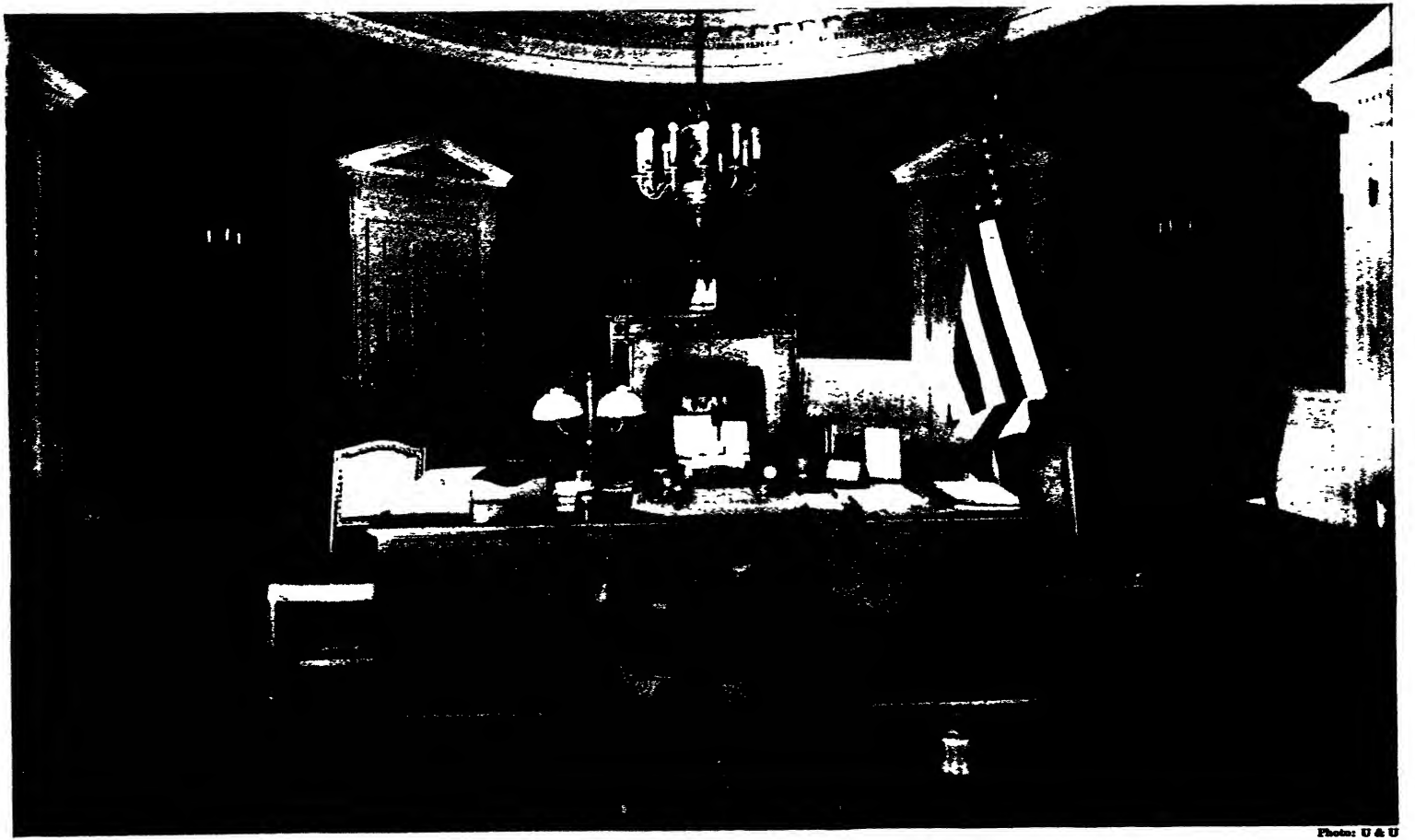


Photo: U & U

PRIVATE OFFICE OF THE PRESIDENT OF THE UNITED STATES

5803

SIX ROADS TO THE WHITE HOUSE

Explaining the Graphic on Opposite Page

The first step leading to the election of the President and Vice-President is noted by few people. In the month of January of election year the national committee of each political party meets to select the city in which its nominating convention shall be held, and to name the date on which it shall convene

The Six Roads

1. In June and July the national conventions are held. It has become customary for the Republican convention to meet about two weeks earlier than the date set by the Democrats. The convention assumes three duties the nomination of a man to be the Presidential candidate; the nomination of a man for Vice-President; the adoption of the party's platform of principles on which to appeal for votes.

In the meantime, the political parties in each state of the Union nominate Presidential Electors—men who, if elected, will later actually cast the ballots which elect the President and Vice-President The Republicans in each state will name as many Electors as the number of Senators and Representatives the state sends to Congress; the Democratic party will make like nominations; if there are minor parties, they are entitled to take like action.

On the first Tuesday after the first Monday in November the people of the various states go to the polls to express their choice for President and Vice-President of the United States. Republicans assume that they are voting for the nominees of their national convention, a like assumption holds good as to the Democrats; members of minor parties adhere to the same view. As a matter of fact, nobody in November votes directly for the nominees of any party for those two offices; the names of the party nominees need not be on the ballots, though they usually appear In the November election the people choose Electors of the President and Vice-President. If a state gives a plurality vote for the Republicans, the Republican Electors are chosen; if a state gives the Democrats a plurality, the Democratic Electors are chosen. Sometimes a state may divide its Electoral vote, choosing some Electors from each party.

On the second Monday in the following January—about two months after the November election—the Electors chosen in each state meet in their respective state capitals and proceed to the election of the President and the Vice-President Collectively, these Electors form the Electoral College. They are guided in their balloting by the action of the national conventions of the preceding summer: if Republican Electors are chosen, they will vote for the nominees of the Republican convention; Democratic Electors are likewise morally bound to designate on their ballots the nominees of their national convention. The number of Electors equals the total number of Senators and Representatives in Congress—at present 531

The result of the balloting of the Electors in each state is recorded and sworn to; copies of the result are mailed (1) to the Secretary of State of the United States, in Washington; (2) to the state Secretary of State, in the state capital; (3) to the United States District Judge in the district in which the capital is situated, and where the election was held

On the second Wednesday in February, Congress then being in session, the Senate and the House meet together and canvass the vote of the Electoral College. If a majority of the 531 votes (at present) are found to have been cast for any one of the nominees for the Presidency, that man is declared elected to that office; the same condition applies to the votes for the Vice-Presidency.

2. The statement is made above that in their balloting the Electoral College members vote for the nominees of their national conventions of the preceding summer. They are in honor pledged to do so, but are not legally committed to such a course. Under the law an Elector may vote for whom he pleases, except that he may not vote for both a President and Vice-President from his own state. In the event of the death of a nominee between the dates of the November election and the meeting of the Electoral College, freedom of action must be preserved for the Electors, though even then they would doubtless consent to be guided by the wishes of the national committee of their party, should the latter choose to act in an advisory capacity, in order to insure majority votes for the men desired.

It must be said that no case has yet arisen when an Elector has defied the wish of his party as expressed in conventional form.

3. If no candidate for President receives a majority in the Electoral College, upon the House of Representatives is imposed the duty before March 4 of choosing a President from the three highest in the voting in the Electoral College. In such choice all the members of the House from each state vote as a unit, each state having one vote. If a majority of the state delegation is Republican, naturally the vote of the state will be cast for the nominee of that party; a like argument holds for a state having a Democratic majority.

If the Electoral College fails to choose a President, it also fails to elect a Vice-President, for party lines are never broken. In such event, the Senate is charged with the election of a Vice-President before March 4.

4. If the House fails to choose the coming President, and the Senate has elected the new Vice-President, then on the 4th of March, at noon, the Senate's choice for Vice-President would become President, for the four-year term.

5. It might possibly happen that the Electoral College, the House, and the Senate would all fail to elect the new President and Vice-President. In such event, the Secretary of State would assume the Presidency temporarily, and he would set in motion the machinery for a new election.

6. In case of death or incapacity of the President, the Vice-President becomes President.

SIX ROADS *to the* WHITE HOUSE



CONVENTION NOMINATION DURING SUMMER

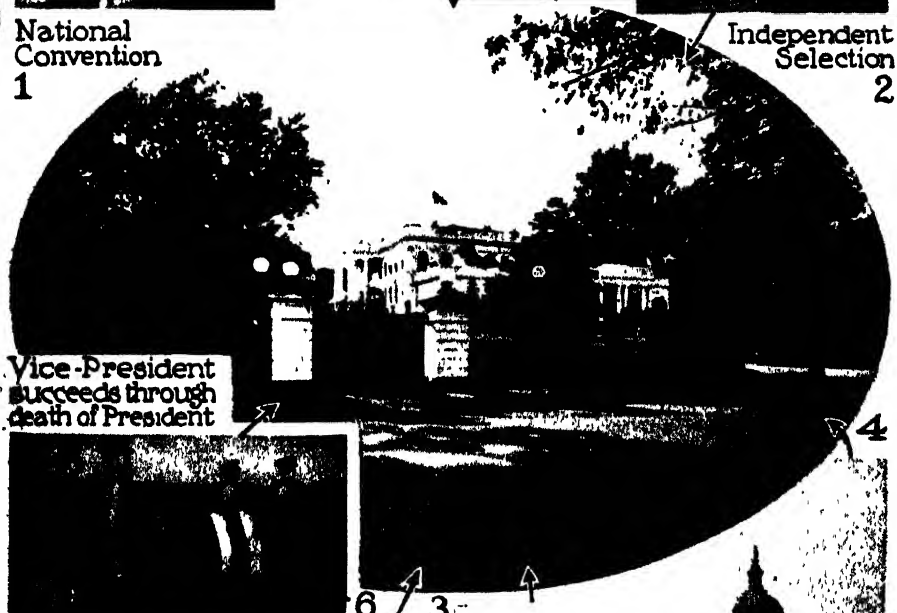
ELECTORAL COLLEGE CHOSEN BY PEOPLE IN NOVEMBER

ELECTION BY ELECTORAL COLLEGE IN JANUARY



National Convention 1

Independent Selection 2



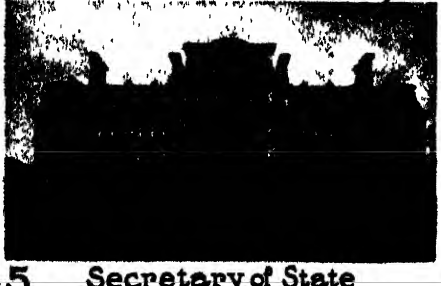
Vice-President succeeds through death of President



4

6

3





5 Secretary of State may become President

Chosen by House of Representatives

Newly-elected Vice-President may assume the office

[For explanation, see opposite page.]



Photo U & U

THE CABINET ROOM IN THE WHITE HOUSE

The President sits at the head of the table. At his right is the chair reserved for the Secretary of State, at his left is the post of the Secretary of the Treasury The other eight members are seated in the order of seniority of their departments

in each state in such manner as the legislature has determined. The balloting for electors occurs on the Tuesday following the first Monday in November of every fourth year; every voter in the United States is eligible to vote for electors. At one time, electors had wide freedom of choice in their selection of a President, but now they are morally pledged to their party's candidate, and the electoral balloting is merely a matter of form. On the second Monday in January following their election, the electors meet in their respective state capitals to cast their votes for President and for Vice-President. These ballots are sent to Congress, which meets in joint session to receive them on the second Wednesday of February. The formality of election of the President is not complied with until Congress counts the electoral votes and announces the winner of the contest. The President is inaugurated on the fourth of March, or on the fifth, if the fourth falls on Sunday.

It is the electoral vote which determines who shall be President, but in every account of a Presidential campaign, one is almost certain to read about the "popular vote." This, as a matter of fact, is the vote cast by the public for electors. Voting for electors is so much a matter of form, however, that no one says that he voted for John Smith, or James Jones, electors, but that he voted for the candidate for President. What he actually does is to vote for electors who will vote for the candidate named by his political party.

Inauguration. The President and President-Elect meet at the White House on the morning of March 4 and are driven in an open White House motor to the Capitol. At noon, in the Senate Chamber, the Senators, Representatives, Cabinet members, ambassadors, generals, admirals, and an interested gallery of spectators see and hear the oath of office taken by the Vice-President, who speaks briefly.

All march out to the east steps of the Capitol. On the platform, the Chief Justice of the Supreme Court, in black robes and skull cap, repeats the Presidential oath of office. With the simple words, "I do," and the kissing of the Bible held by the Chief Justice, the President-Elect becomes the President. In that capacity, he reads his inaugural address.

An innovation introduced in 1925 was the broadcasting by radio of the inaugural ceremonies.

Powers and Privileges of the President. The President's duty is to preserve, protect, and de-

THE PRESIDENTS OF THE UNITED STATES

	BORN	NATIVE STATE	COLLEGE	OCCUPATION OR PROFESSION	POLITICAL PARTY	AGE AT INAUGURATION	SERVED	AGE AT DEATH	PLACE OF BURIAL
1. George Washington	1732	Virginia		Planter	Federalist	57	1789-1797	67	Mount Vernon, Va.
2. John Adams	1735	Massachusetts	Harvard	Lawyer	Federalist	61	1797-1801	90	Quincy, Mass.
3. Thomas Jefferson	1743	Virginia	William and Mary	Planter Lawyer	Republican*	57	1801-1809	83	Monticello, Va.
4. James Madison	1751	Virginia	Princeton	Lawyer	Republican*	57	1809-1817	85	Montpelier, Va.
5. James Monroe	1758	Virginia	William and Mary	Lawyer	Republican*	58	1817-1825	73	Richmond, Va.
6. John Quincy Adams	1767	Massachusetts	Harvard	Lawyer	Republican*	57	1825-1829	80	Quincy, Mass.
7. Andrew Jackson	1767	North Carolina		Lawyer	Democrat	61	1829-1837	78	Hermitage, Tenn.
8. Martin Van Buren	1782	New York		Lawyer	Democrat	54	1837-1841	79	Kinderhook, N. Y.
9. William H. Harrison	1773	Virginia	Hampden-Sidney	Farmer	Whig	68	1841 (1 mo.)	68	North Bend, Ohio
10. John Tyler	1790	Virginia	William and Mary	Lawyer	Democrat	51	1841-1845	71	Richmond, Va.
11. James K. Polk	1795	North Carolina	University of North Carolina	Lawyer	Democrat	49	1845-1849	53	Nashville, Tenn.
12. Zachary Taylor	1784	Virginia		Soldier	Whig	64	1849-1850	65	Springfield, Ky.
13. Millard Fillmore	1800	New York		Lawyer	Whig	50	1850-1853	74	Buffalo, N. Y.
14. Franklin Pierce	1804	New Hampshire	Bowdoin	Lawyer	Democrat	48	1853-1857	64	Concord, N. H.
15. James Buchanan	1791	Pennsylvania	Dickinson	Lawyer	Democrat	65	1857-1861	77	Lancaster, Pa.
16. Abraham Lincoln	1809	Kentucky		Lawyer	Republican	52	1861-1865	56	Springfield, Ill.
17. Andrew Johnson	1808	North Carolina		Tailor	Republican	56	1865-1869	66	Greeneville, Tenn.
18. Ulysses S. Grant	1822	Ohio	West Point	Soldier	Republican	46	1869-1877	63	New York City
19. Rutherford B. Hayes	1822	Ohio	Kenyon	Lawyer	Republican	54	1877-1881	70	Fremont, Ohio
20. James A. Garfield	1831	Ohio	Williams	Lawyer	Republican	49	1881 (6½ mo)	49	Cleveland, Ohio
21. Chester A. Arthur	1830	Vermont	Union	Lawyer	Republican	50	1881-1885	56	Albany, N. Y.
22. Grover Cleveland	1837	New Jersey		Lawyer	Democrat	47	1885-1889	71	Princeton, N. J.
23. Benjamin Harrison	1833	Ohio	Miami	Lawyer	Republican	55	1889-1893	67	Indianapolis, Ind.
24. Grover Cleveland	1837	New Jersey		Lawyer	Democrat	55	1893-1897	71	Princeton, N. J.
25. William McKinley	1843	Ohio	Allegheny College	Lawyer	Republican	54	1897-1901	58	Canton, Ohio
26. Theodore Roosevelt	1858	New York	Harvard	Publicist	Republican	42	1901-1909	61	Sagamore Hill, Oyster Bay, N. Y.
27. William H. Taft	1857	Ohio	Yale	Lawyer	Republican	51	1909-1913		
28. Woodrow Wilson	1856	Virginia	Princeton	Educator	Democrat	56	1913-1921	67	Washington, D. C.
29. Warren G. Harding	1865	Ohio	Ohio Central	Editor	Republican	55	1921-1923	57	Marion, Ohio
30. Calvin Coolidge	1872	Vermont	Amherst	Lawyer	Republican	51	1923-1929		
31. Herbert C. Hoover	1874	Iowa	Stanford	Engineer	Republican	54	1929-		
32.									
33.									

*The Republican party of Jefferson, Madison, Monroe, and John Quincy Adams is now known as the Democratic party

fend the Constitution. In so doing he manages the foreign relations of the United States; he may call Congress in special session to consider any measures he believes vital to the welfare of the country; he addresses Congress in person or in writing for the purpose of outlining his policies or urging legislation; he may veto legislative acts of Congress; with the approval of the Senate, he appoints officers of the United States whose appointments are not otherwise provided for in the Constitution; he may grant pardons and reprieves to offenders against Federal laws, and may personally assume command of the army and navy, of both of which the Constitution makes him commander in chief. In practice, he delegates many of these powers to others, but he alone is directly responsible to the people. The President's right to resign is recognized by the Constitution. For any of his acts he is not liable to an ordinary court or magistrate; but he may be impeached by the House of Representatives and tried by the Senate. If he is convicted and removed from office, he may then be tried as a private citizen in ordinary courts.

The President receives a salary of $75,000 a year, and this compensation may not be increased or lessened during his term. He also has the free use of the Executive Mansion, or White House, together with its furnishings and equipment, and an allowance for their maintenance, which may vary from year to year. He is also allowed $25,000 a year for the expenses of travel, but he is prohibited by the Constitution from receiving any compensation or emolument from any foreign country or ruler. E.D.F.

Related Subjects. The reader is referred in these volumes to the following articles

Constitution of United States (Art. II)
Electoral College
Impeachment
Political Parties
Presidential Succession Act

PRESIDIO. See SAN FRANCISCO; PERSHING, JOHN J.

PRESS, LIBERTY OF THE. In times of peace, all liberal governments give their citizens the right to publish anything they choose, making them responsible under the law of libel for issuing false statements, and under the criminal law for publishing obscene matter. For the protection of society, restrictions such as these are essential. This privilege, known as *liberty of the press*, is one of the fundamental rights of the people of democratic nations, and it has been won, like other common rights, after centuries of struggle. In some countries, the right to criticize the policies of the government or of high officials is greatly curtailed, even in time of peace. An example may be found in Italy under the Fascist régime. Soviet Russia also restricts the press in this manner. Probably the greatest liberty of the press is found in the English-speaking countries—the British Commonwealth of Nations and the United States. The First Amendment to the American Constitution declares that Congress shall pass no law abridging the freedom of the press. See LIBEL; CENSORS.

PRESSBURG, *pres' boorK.* See CZECHOSLOVAKIA (Principal Cities).

PRESSURE. See GAS; LIQUID.

PRESS CLIPPING BUREAUS, known also as *clipping bureaus*, are maintained for the purpose of furnishing the public with material that has been printed about a particular individual, or about something in which that one may be interested. An author, for instance, by subscribing to such a service, may have sent to him all the notices appearing in the newspapers and magazines regarding him and his books. The rate charged is usually based upon the extent of the service.

PRESTER JOHN, a legendary Christian priest and king, whose history is somewhat obscure. He is supposed to have lived in the twelfth century and to have ruled over a vast domain in the Far East, beyond Persia and Arabia. Later, he was identified with the king of Abyssinia, perhaps because early writers often confused India with Ethiopia.

The title means *presbyter* or *priest*, and the history of Prester John especially emphasizes his religious character. He was considered the greatest Christian monarch in the world, and the wonders of his empire impressed the thought of Europe for two centuries.

The first mention of Prester John is in an account by Bishop Otto of Freisingen. This chronicle relates that Presbyter John had fought the kings of the Medes and the Persians in order to conquer them for the true faith, and it describes at some length the wealth and power of the great king and priest. His reputation was further enhanced by a letter addressed to Emperor Manuel I of the Byzantine Empire, in which the writer, signing himself Presbyter Joannes, described the richness of his realm and expressed his desire to visit the Holy Sepulcher, accompanied by a great army of his followers. Other references to Prester John are made in the tales of various travelers, including Marco Polo, who identifies him with the king of a powerful tribe in Mongolia.

By the fifteenth century, the name disappears from Asiatic history, and Prester John begins to be heard of as an African prince. Unfortunately, the record is confused, and it is impossible to reconcile the many conflicting accounts of his location and his exploits. For further information, the reader is referred to *Curious Myths of the Middle Ages*, by S. Baring-Gould, and *Prester John*, by John Buchan.

PRESTON, ENGLAND. See ENGLAND (The Cities).

PRETENDER. See JAMES (II, England).



Photo Visual Education Service

PREVAILING WESTERLIES LEAVE THEIR MARK UPON THE FACE OF NATURE

PRETORIA, *pre toh' rih ah,* the seat of government of the Union of South Africa and the capital of the Transvaal province, is situated forty-six miles by rail northeast of Johannesburg. It occupies both banks of the Aapies, a branch of the Limpopo, and is 4,470 feet above the sea. A fine university heads the educational system. The Union Government Buildings, which are the finest public edifices in South Africa, occupy an impressive site on a hill about a mile from the center of the city. Pretoria was founded in 1855, and was named after Andries Pretorius, a Dutch leader. When the Union of South Africa was constituted, in 1909, Pretoria and Cape Town were rivals for the honor of being named the capital; this matter was adjusted by making Pretoria the seat of administration and Cape Town the seat of the Parliament. Population, 75,000, of whom 47,000 are whites. See UNION OF SOUTH AFRICA.

PRETORIUS, ANDRIES. See above.

PREVAILING WESTERLIES, the prevailing winds that blow over the North and South Temperate zones in an easterly direction. In the southern hemisphere the prevailing westerlies attain such force and velocity on the sea that the sailors call them the "roaring forties." Owing to the great land masses in the northern hemisphere, the prevailing westerlies of the North Temperate Zone are frequently diverted from their course by mountain ranges and other causes. They are also interrupted by the great cyclonic storms that are common over land and sea in this zone.

The United States and the southern half of Canada are within the path of the prevailing westerlies, and while their direction may be changed near the surface, it is usually constant in the upper air, as may be seen by watching the clouds, whose movement is eastward. Aviation is greatly influenced by these winds; flying from west to east is much easier than from east to west. Heavy winds blowing eastward have made airplane flights from Europe to America particularly hazardous. See TRADE WINDS; WIND; AIRCRAFT. R.H.W.

PREVOST'S, *pra' voze,* **THEORY OF EXCHANGES.** See HEAT (How Heat Travels).

PRIAM, in Greek legend, the last king of Troy and son of Laomedon. Priam had nineteen sons by his second wife, Hecuba, and in all was the father of fifty sons and fifty daughters. Cassandra and Polyxena were among his daughters, and Hector and Paris the most famous of his sons.

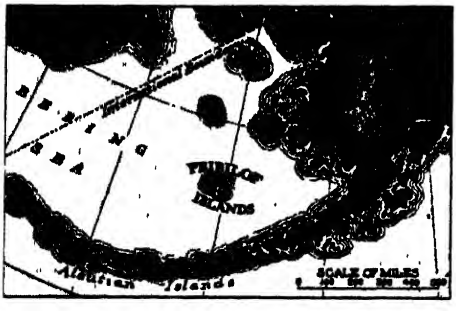
The abduction of Helen of Troy, by Paris, was the cause of the Trojan War. While Paris was at the home of Menelaus, king of Sparta, he carried away the latter's beautiful wife. The war might have been averted by Priam if he had consented to give up Paris and Helen when the messengers first appeared in front of Troy. As he declined to do this,

the famous siege continued for ten years, and during that time, Priam saw most of his sons killed in the defense of their city. When Hector, the best and bravest, was slain by Achilles, the father went to the Grecian camp and begged the body of his son. Even the gods assisted him in reaching the tent of Achilles, where he was received with the honor due his position. Achilles not only returned the body of Hector, but granted a truce of twelve days for the funeral ceremonies. When Troy fell into the hands of the Greeks, Priam was killed by Neoptolemus, the son of Achilles, at the altar of Jupiter, to which he had fled for protection.

Related Subjects. The reader is referred in these volumes to the following articles:

Achilles	Hecuba	Paris
Hector	Helen of Troy	Troy

PRIBILOF, *pre' be lofe,* **ISLANDS,** famous as the home of the fur seal, are situated in the Bering Sea, 200 miles southwest of Alaska's mainland. Gerassim Pribilof, a Russian fur-



THE PRIBILOF ISLANDS

hunter, discovered the islands in 1786, and when the United States acquired Alaska, in 1867, this island group was included. Saint Paul and Saint George are the largest of the group; their areas are thirty-five and twenty-five square miles, respectively. The former has a population of about 300; the latter, 100. There is a United States wireless station on Saint Paul. The islands are well located to be a safe retreat for seals, for they are isolated and fogs are prevalent. They have been officially a fur-seal reserve since 1868. The herd consists of over 700,000 individuals. See SEAL (Fur-Seal Legislation).

PRICE. See SUPPLY AND DEMAND.

PRICE, STERLING (1809-1867), an American Confederate soldier who achieved distinction in the War of Secession. He was born in Virginia, educated at Hampden-Sidney College, and in 1831 removed to Missouri. In 1844 he was elected to Congress, but resigned to serve in the Mexican War, and in 1847 was made military governor of the Mexican state of Chihuahua. From 1853 to 1857, he was governor of Missouri, and at the beginning of the War of Secession, joined the Confederacy and became major general of the Missouri volunteers. At first he made a great effort to win Missouri from the Federals, but was compelled to abandon the idea. Price served under Van Dorn around Corinth, but in 1863 was transferred west of the Mississippi River. After the war he endeavored to found a Southern colony at Cordoba in Mexico, but the plan failed.



Photo: Brown Bros.

STERLING PRICE

PRICKLY ASH, one of a genus of trees or shrubs belonging to the rue family. The name refers to the sharp prickles on the twigs, and to the similarity between the leaves of the prickly ash and those of the true ash (see ASH). The *southern prickly ash* is a small tree, not over twenty-five feet tall, that grows on the sandy coast of Virginia and southward. A more northerly species, called locally in the South *toothache tree,* for what reason is not known, is found from Quebec southward to Virginia and Kentucky and west to Minnesota. It is an aromatic shrub with yellowish-green flowers, and is found chiefly in rocky woods and on river banks. G.M.S.

Scientific Names. The scientific name of the rue family is *Rutaceae* The southern prickly ash is *Zanthoxylum clava-herculia,* the northern is *Z. americanum.*

PRICKLY PEAR, OR **INDIAN FIG,** common names of a genus of plants belonging to the cactus family, most of which bear a prickly, edible fruit, somewhat resembling a pear or fig (see CACTUS). A large number of the species are found in the Southwestern United States, and are there cultivated for human and stock food. Spineless varieties, found naturally or produced by breeding, are used especially as food for cattle. Sometimes the prickles of the spiny sorts are removed by singeing or rubbing with leaves or grass. The prickly pear has been introduced into the Mediterranean countries, where it is cultivated for its fruit. Its roots penetrate rocky crevices and make barren soil suitable for vegetation of other kinds. On Mount Vesuvius, the prickly pear is planted in the lava seams as soon as the flow has cooled, to prepare the barren ground for cultivation. In 1788 the plant was introduced into Australia, to serve as food for the cochineal insect, which yields a red dye. The expectation of establishing a

dye industry was not realized, and, moreover, the prickly pear spread over the country to such an extent that large areas are overrun with it and have become waste land. B.M.D.

Scientific Names. The cactus family is known scientifically as *Cactaceae*. The plants called prickly pear constitute the genus *Opuntia*. The common species is *O. vulgaris*.

PRIDE'S PURGE. See RUMP PARLIAMENT.

PRIEST, the title given ordained ministers in the Roman Catholic, Greek, and Episcopal churches (see articles on these churches). It is the duty of priests to care for the spiritual needs of their people, and to perform the rites and ceremonies and expound the doctrines of their respective denominations. In the Roman Catholic Church there are many orders of priests, all of whom are pledged to refrain from marriage. Some take vows of poverty and self-sacrifice. Priests have the lowest rank in the Roman Catholic hierarchy. In the Episcopalian bodies, the priests form the second order of clergy, the bishops ranking first. The institution of priesthood had an important place in various religions of antiquity, especially among the Egyptians, Hindus, and Hebrews. See HIGH PRIEST.

PRIESTLY, JOSEPH. See OXYGEN.

PRIESTLY CODE. See PENTATEUCH.

PRIMARY COLORS. See COLOR; SPECTRUM ANALYSIS.

PRIMARY ELECTION, an election in which the registered voters express their preferences regarding candidates for office in their respective parties. The primary election is a *nominating* election; it chooses candidates who in turn stand for election at forthcoming regular elections. Each candidate in a primary has his name placed on his party's ticket by a petition, which must be signed by a certain percentage of the legal voters of his party residing in the election district.

At a primary election, the voter must make known his party allegiance before receiving his ticket; he cannot vote in a primary except for men on his party ticket. However, when the regular election day arrives, he may vote with absolute independence. If the voter then prefers some of the nominees of another party, he is at liberty to vote for them.

At first, primaries were restricted to local elections, but now they are general throughout the United States, and state officers, Representatives in Congress, United States Senators, and Presidential electors in many states are nominated at primary elections. The primary is conducted the same as any other election, and is governed by the same laws, except that the voter is restricted to voting for candidates of his party. The direct primary is an American institution, and has not as yet been adopted to any extent in countries other than the United States. See ELECTION.

PRIMATES, the highest order in the animal kingdom. It includes man and those animals which are nearest to him in physical characteristics, and have nails rather than claws or hoofs (see list of related subjects, below). The name is derived from the Latin *primus*, meaning *first*. Primates constitute an order of the class *Mammalia*. W.N.H.

Related Subjects. For a discussion of the chief characteristics of the animals included in the order and for other points of interest, see in these volumes the following articles:

Ape	Loris
Aye-Aye	Mammals
Baboon	Man
Chimpanzee	Mandrill
Classification	Marmoset
Geology (Cenozoic Era)	Monkey
Gibbon	Orang-Utan
Gorilla	Sapajou
Howlers	Zoology
Lemur	

PRIME MERIDIAN. See MERIDIAN; LONGITUDE AND TIME.

PRIME MINISTER. See CABINET.

PRIMO DE RIVERA, MIGUEL (1870-1930), Marquis de Estella, a Spanish soldier and dictator, was born in Jerez de la Frontera, and received a military education in Madrid. His personal bravery, unselfishness, honesty, and patriotism made him a successful soldier, and constantly receiving higher ranks, he served in Morocco, Cuba, the Philippines, Barcelona, and Algeciras. He was made governor of Cadiz in 1915, and though Spain did not enter the World War, he visited the Western Front. He did not agree with Spain's policy in Morocco, the retention of which he thought was more of a burden than a help, and frank public speeches in criticism of this policy twice cost him his office However, his personality, ability, and understanding won him a place in the hearts of the people, and he never was long without a post. He studied the scandalous state of politics in his country, and observed the uprisings and revolts in Catalonia and Barcelona, the gross mismanagement of all the affairs of state, and the graft and high salaries of public officials, while the small pay of the majority compelled them to live in poverty. He believed the underlying cause of it all was the decayed and rotten system of government into which Spain had allowed itself to fall. Without bloodshed, and with the extraordinary bravery he possesses, he put aside the old constitution, informed the well-fed officials that their turn was over, and announced himself dictator of Spain after the fashion of his idol, Mussolini. King Alfonso had confidence in this daring soldier and did not resist his coup d'état.

Primo de Rivera's methods were thorough from the start, and to prevent the spread of propaganda and opposition to the new order, he followed the tactics of all dictators, and instituted a strict censorship of the press.

Bolshevism he would not tolerate; syndicalism, which was gaining a hold in Barcelona, was squelched; and the separatist ideas of Catalona suppressed. Reforms in taxation, education, labor conditions and wages, justice, and municipal administration were begun at once. He maintained a military régime until 1925, when his wisdom warned him that there was more permanency in a civil government. However, he retained his power as dictator, and assumed the title Premier. Changing conditions caused him to alter his ideas concerning Morocco, and with the help of France, the Spanish troops were finally able to overwhelm the Riffian tribesmen of Morocco. (See MOROCCO; RIFF.) It must be admitted that Spain enjoyed a far greater degree of peace and development under the dictatorship of de Rivera than during the old order, and he continued unchallenged except for minor revolts until February, 1930, when pressure of public opinion drove him from power; he died a month later. The country returned to constitutional government under a new Premier.

PRIMOGENITURE, *pri mo jen' ih ture,* a rule of law which requires that the father's real estate be left to his eldest son, or to the latter's male heirs. The ancient peoples recognized some such procedure, but the term as now used describes a rule that grew out of the military necessities of the feudal period, when it was deemed expedient to strengthen the power of the son first able to bear arms for the king. In England, where it was introduced by the Normans, primogeniture operated only when a person died without making a will. In that case, the eldest son succeeded to the real estate. If the son, likewise, was dead, the property went to his eldest son. Only when the male line was extinct did the property pass to the daughters. The rule survives in the English system, and in some other European countries with respect to the succession to the throne.

PRIMROSE, the common name of a genus of early-blooming plants, the cultivated forms of which are among the loveliest of ornamental garden flowers. Many of these have been derived from the *common primrose,* a species that grows wild in woods and meadows of Europe. It has deeply veined leaves and yellowish-white blossoms, the latter borne singly on the flower stalks. In the garden and hothouse, one sees flowers of pure yellow, pink, lilac, and various shades of red, and single and double varieties. Some species make excellent potted plants for the window garden, and are attractive in both their flower and foliage. Primroses grown in the garden need shade and rich, moist loam. They may be started from seed, planted in February in shallow pans or boxes in a mixture of sand, loam, and leaf mold. The young plants should be set out in the open in May, then placed in the permanent bed in September and protected over winter. They will flower the following spring.

B.M.D.



A primrose by a river's brim
A yellow primrose was to him,
And it was nothing more
—WORDSWORTH. *Peter Bell.*

Scientific Names. Primroses constitute the genus *Primula* in the family *Primulaceae.* The common primrose is *P. vulgaris.* A closely related species, *P officinalis,* is commonly known as *English cowslip.* Among the greenhouse and window forms are the Chinese primrose, *P sinensis,* and the Japanese, *P. obconca.* The so-called *evening primrose,* both wild and cultivated, belongs to another family.

PRINCE, *prinz,* a royal or honorable title, derived from a Latin word meaning *first.* As an honorary title, it was applied in the Roman republic to the senator who stood first on the censor's list. The adoption of the title by Augustus first associated with it the idea of sovereignty. In the course of time, it came to be applied to certain sovereigns of smaller states more or less independent.

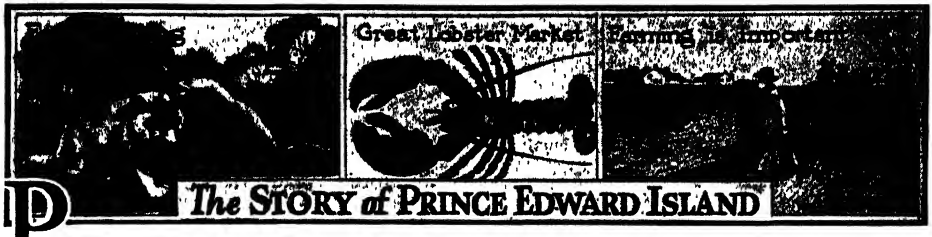
On the continent of Europe, the title is still employed with its old meaning; the families using it are eminent, among the first families of the land, but they are not connected with the reigning family, nor do they exercise sovereign powers. In England, in the strict language of heraldry, which faithfully reflects early customs, some of the classes of peers are still entitled to the old address of prince, but practically its use is restricted to members of the royal family; even in their case, with the exception of the Prince of Wales, it is a courtesy title, not one of right; they are and remain commoners, unless raised to the peerage by the Crown.

Related Subjects. The reader is referred in these volumes to the following articles:

Baron	Prince of Wales
Earl	Titles of Honor
Heraldry	Viscount
Marquis	William (I, England)

PRINCE CHARLES FORELAND. See SPITSBERGEN.

PRINCE CONSORT, the husband of a reigning queen. The most notable prince consort during the past century was Albert, prince of Saxe-Coburg-Gotha, who was the husband of Queen Victoria of Great Britain. See ALBERT; VICTORIA.



The STORY of PRINCE EDWARD ISLAND

PRINCE EDWARD ISLAND, named in honor of the father of Queen Victoria, is the smallest province of the Dominion of Canada. It lies in the southern part of the Gulf of Saint Lawrence, sheltered on three sides by Cape Breton Island and the mainland of Nova Scotia and New Brunswick. Separating the island from the mainland is Northumberland Strait, which varies in width from nine to thirty miles. The island is irregular in shape, although its shores are roughly parallel to those of the mainland, and its coast line is broken by hundreds of bays, inlets, and projections. For the most part the coasts are low and sandy, the red sandstone of which the island is formed being easily worn by wind and water. Especially on the north shore are fine beaches, but on the south are occasional low sandstone cliffs.

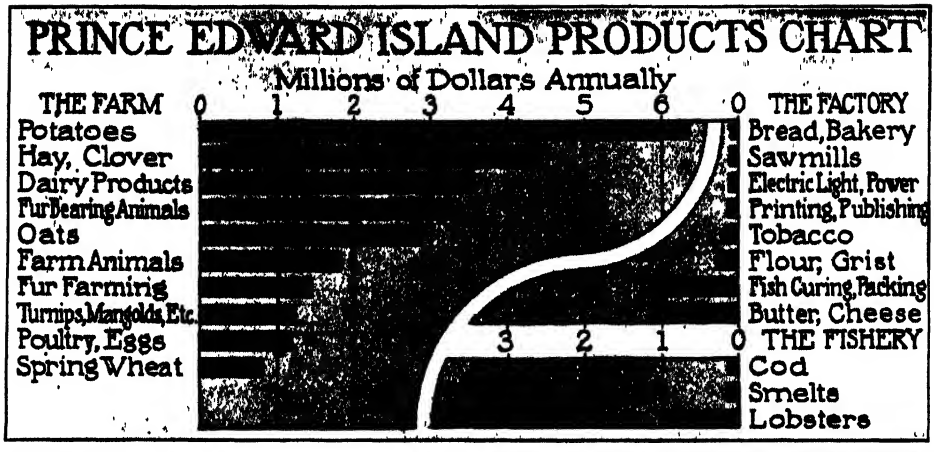
So deep are the indentations of the shore that they divide the island into three almost separate parts. At high tide, there is only a mile of dry land between Bedeque Bay on the south and Richmond Bay on the north, and there is only about a mile and a half between the head of Hillsborough River on the south and Savage Harbour on the north. In the north the land nowhere rises above 175 feet, but in the central third are hills over 300 feet high. The island is 130 miles long, and has an average width of thirty miles. Its area is 2,184 square miles. It is about two-thirds the size of its neighbor, Cape Breton Island, and is one-seventeen-hundredth part of the Dominion. Fogs are much less common on Prince Edward Island than in Newfoundland and Nova Scotia, and the generally healthful climate is milder than that of the near-by mainland.

The Forests. Prince Edward Island has abundant moisture for vegetation. At one time the entire island was covered with forests, of which between one-third and one-fourth remain. Birch, beech, maple, cedar, spruce, and pine are the chief species of trees. With an abundance of timber, the province naturally turned to shipbuilding, but after 1880 this industry declined and has since almost disappeared. Timber is still cut in considerable quantities, but is put to less picturesque uses. The annual value of forests products is about $132,000.

Soil and Products. It is noteworthy that of the 13,701 farms on the island, only 277 are occupied by tenants, the remainder being owned or partly owned by the farmers. As soon as land was cleared, the early settlers began to cultivate the soil. Practically the entire island, except certain areas of swampy land, is suitable for cultivation. The soil, a light loam, is covered in most places by a layer of decayed vegetable matter, and itself rests on clay and sandstone. As the settlers for generations drew out of the soil all they could, and replaced little or nothing, in time large sections showed signs of exhaustion, from which agriculture has not yet fully recovered. The fertilizer now in general use is called "mussel mud," and is dredged from river beds and bays on the island.

Hay, oats, and potatoes are the principal field crops, and apples the chief fruit, followed by strawberries. Hogs and cattle are raised in the province in considerable numbers, but horses constitute more than two-fifths of the value of the livestock, which does not exceed $2,000,000. Dairy and poultry farming are growing in importance. One of Prince Edward Island's industries—fur farming—was unique for a number of years, but has been copied in other provinces, and in various parts of the United States. The mainstay of the business is the silver fox. A single silver fox is valued at from $300 to $2,000. Sales of pelts and of foxes for breeding purposes average $1,500,000 to $3,000,000 per year. Other fur-bearing animals, including the beaver, mink, muskrat, and skunk, are also being raised for their fur.

The Fisheries. Although relatively a small part of the Dominion's fisheries, the Prince Edward Island fisheries are of great value in proportion to the population of the province. Nearly 6,000 people are employed in the industry. Lobster averages sixty per cent of the value of the catch; other important sea foods are cod, herring, oysters, smelts, and mackerel. The oyster beds have recently been extended



from 15,000 acres to over 20,000 acres, eventually to be increased to nearly twice that area. The packing or preserving of fish is an important branch of industry.

Education and Government. The public school system of the province was established in 1852; since that date, elementary education has been free. There are two colleges: Prince of Wales College, the head of the public-school system, and Saint Dunstan's College, a Roman Catholic institution. Both are at Charlottetown.

Prince Edward Island, like the other Canadian provinces, has as the titular head of its government the lieutenant-governor. The legislative assembly is composed of a single house of thirty members. The province is divided into three counties—Prince, Queens, and Kings—of nearly equal size. The county towns are, respectively, Summerside, Charlottetown, and Souris.

When Prince Edward Island entered the Confederation, in 1873, it was allowed six members in the House of Commons; this number was reduced to four in 1901.

The People. Prince Edward Island, like the other Maritime Provinces, has suffered from heavy emigration to the Canadian Northwest. In fact, in the decades from 1901 to 1921, the population of the province decreased from 103,259 to 88,615; in 1927 it was 86,700, a further decrease. In 1891 the population was 109,000, the highest it has ever been. The density of population per square mile (40.53 in 1921) and the average number of persons to a family, 5.51, are greater than those of any other province. Most of the people are of British descent, but there are a few descendants of French Acadians and United Empire Loyalists. Charlottetown, the capital city, has 12,500 inhabitants.

History. It is possible that the island was seen by Cabot in 1497, but the first white man known to have visited it was Jacques Cartier,

Questions on Prince Edward Island

(An Outline suitable for Prince Edward Island will be found with the article "Province.")

When did this province have its largest population?

How did the opening up of regions far to the west affect this eastern province?

What is the average density of population? How does this compare with that of the Dominion as a whole? With that of the other provinces?

Why are there few steep cliffs on the shore line at high tide?

How many provinces the size of Prince Edward Island would it take to make a Dominion as large as Canada?

What climatic advantage has the island over a neighboring island and the mainland?

What percentage of the farms on Prince Edward Island are owned by the resident farmers?

Why did large portions of the agricultural land become exhausted?

What interesting industry, now practiced in some of the other provinces, was for years confined to Prince Edward Island?

How large a percentage of the population is engaged in fishing?

What is "mussel mud," and for what is it used?

How many houses are there in the legislative assembly? How many of the provinces resemble Prince Edward Island in this respect?

Who was the first white man who visited the island? What did he think it was?

What did the French call the island? In whose honor was the present name given?

When did Prince Edward Island become a part of the Dominion of Canada?



Photo: Canadian Air Force

AIRPLANE VIEW OF CHARLOTTETOWN

the French explorer, who came in 1534. Cartier, however, thought it a part of the mainland. In 1603 Champlain took formal possession of the island for the king of France. Sixty years later, the Company of New France, to whom it had been granted, regranted it to one Captain Doublet, of the French navy, who lost it soon afterward because he failed to bring settlers. After the Peace of Utrecht, the French made several attempts to settle it, but in 1758 there were few residents to offer resistance to British occupation after Louisburg fell. At that time, the population of the island was in the neighborhood of 4,000.

In 1763 the island, together with the remainder of French Canada, passed formally under British rule, and for the first ten years was administered through Nova Scotia; the first parliament under the separate government met in 1773. In 1767 the island was divided into townships of 20,000 acres each. These were granted in many cases to speculators and other non-residents who had more or less shadowy claims on the British government's generosity. Thus it happened that Prince Edward Island suffered for a century (until 1876) from absentee landlordism.

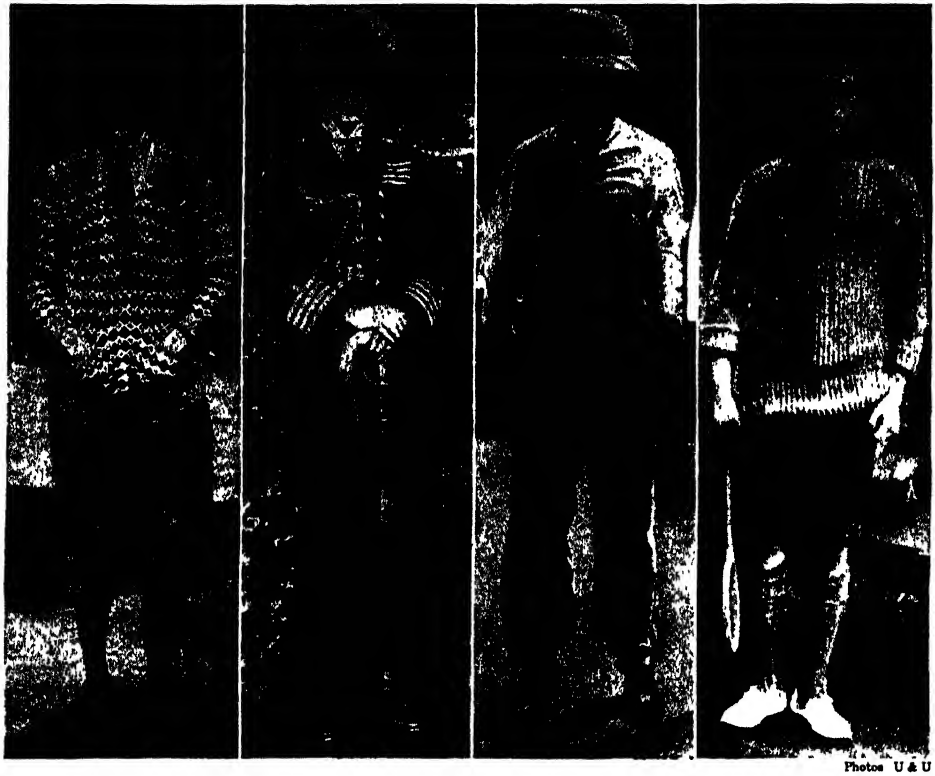
Under French rule, the island was known for nearly two centuries as *Isle Saint Jean* (Island of Saint John). The name was changed in 1798 to Prince Edward, in honor of the Duke of Kent, then commanding the British troops in North America. At Charlottetown was held in 1864 the important conference which paved the way for Confederation, but the colony refused to join the Dominion until 1873.

The province has long been interested in securing a tunnel under Northumberland Strait from Cape Traverse to the mainland, but the Dominion government has not yet agreed to its construction. The Dominion government does, however, operate the Prince Edward Island Railway as a branch of the Intercolonial Railway, and a car ferry steamer connects the island railway with the Canadian National on the mainland. The total railroad mileage of the province was 279 miles in 1929. The main line runs from Tignish southeast to Souris, and branches extend to Georgetown, Charlottetown, and other points. Since the winter of 1917-1918, daily steamship communication with the mainland has been provided. G.H.L.

Related Subjects. The reader who is interested in Prince Edward Island will find helpful material in these volumes in the following articles

Canada, Dominion of	Province
Fur and Fur Trade	United Empire Loyalists

PRINCE OF WALES, the title bestowed on the male heir first in line of succession to the throne of Great Britain. He is therefore almost always the eldest son of the king. The title was created in 1301 by Edward I, the



Photos U & U

INTERESTING VIEWS OF THE MANY-SIDED CAREER OF THE POPULAR HEIR TO BRITAIN'S THRONE
From left to right: In a bright and typical golf suit, in the full dress of a naval officer; in mechanic's clothes, when he inspected the boilers of a battleship; in athletic costume, ready to play squash aboard ship

English monarch who accomplished the conquest of Wales [see WALES (History)]. Tradition has it that when a baby prince was born in one of the castles newly built in Wales by the victorious monarch, he was presented to the Welsh people as a prince "who could not speak English."

This quite humorous tale may be a myth, but when the boy was seventeen years old, his father formally made him Prince of Wales; he became King Edward II. His son, Edward III, was known as Edward of Windsor, and was never created Prince of Wales. But it has since become an invariable custom to honor the heir to the throne in this way. The title is not hereditary, but must be created for each prince so honored, and is purely honorary; no power or authority attaches to it. As heir-apparent, the Prince of Wales receives an income from the Duchy of Cornwall, which amounts to about $325,000 a year.

The present Prince of Wales received his title on July 13, 1911, about three weeks after the coronation of his father, George V.

Biography. For the history of the present Prince of Wales, see EDWARD, PRINCE OF WALES.

PRINCE OF WALES ISLAND, a small island off the coast of Alaska (which see).

PRINCE'S FEATHER. See AMARANTH.

PRINCETON, BATTLE OF. See REVOLUTIONARY WAR.

PRINCETON, N. J. See NEW JERSEY (back of map).

PRINCETON UNIVERSITY, one of the oldest and most influential universities in the United States. But three American colleges, Harvard, William and Mary, and Yale, are older. The institution is the outgrowth of the College of New Jersey, founded in 1746 at Elizabethtown through the efforts of influential Presbyterians. The first commencement exercises were held in 1748 at Newark, whither the college had been removed the same year. In 1752 it was decided to make Princeton the permanent seat of the institution, and two years later the corner stone of the first building, Nassau Hall, was laid. Sessions were begun at Princeton in the fall of 1756, and 140 years later the corporate title of the college was changed to Princeton University. Though it is not a sectarian college, Presbyterians have made generous contributions for the support

of the university, and have been influential in shaping its policies. Its government is in the hands of a self-perpetuating board of trustees, of which the governor of New Jersey is ex-officio president. Women are not admitted to any courses.



CLEVELAND MEMORIAL TOWER
It was completed in 1913, and is 273 feet high

As now organized, the university embraces the academic department, the school of science, the graduate school, together with the technical departments of civil and electrical engineering. Bachelor's degrees are granted in the academic department, Bachelor of Science and Civil Engineer in the school of science, and master's and doctor's degrees in the graduate school. In connection with the graduate department is the Graduate College of Residence, where students are accommodated at very moderate rates. The faculty numbers about 300, and the student enrollment is over 2,500. On the beautiful campus of 632 acres is a group of buildings not surpassed by those of any other American university.

Woodrow Wilson was president from 1902 to 1910. Grover Cleveland was a lecturer and trustee of the university for ten years. President Wilson was succeeded in the Princeton presidency by John Grier Hibben (see below), when the former became governor of New Jersey.



Photo Brown Bros.
JOHN GRIER HIBBEN

John Grier Hibben (1861-) was born at Peoria, Ill., and educated at Princeton University, Princeton Theological Seminary, and the University of Berlin. In 1887 he was ordained to the ministry of the Presbyterian Church, and for four years was pastor at Chambersburg, Pa. He became instructor in logic and psychology at Princeton in 1891, was later promoted to a professorship, and in January, 1912, was chosen president of the institution to succeed Woodrow Wilson, who had resigned to become governor of New Jersey. Dr. Hibben enjoys high rank among writers on philosophical subjects. His books include *Inductive Logic, The Problems of Philosophy, Deductive Logic, The Philosophy of the Enlightenment, A Defense of Prejudice, Hegel's Logic,* and *The Higher Patriotism* He is also editor of the series known as *Epochs of Philosophy*

PRINCIPAL. See AGENT; INTEREST.

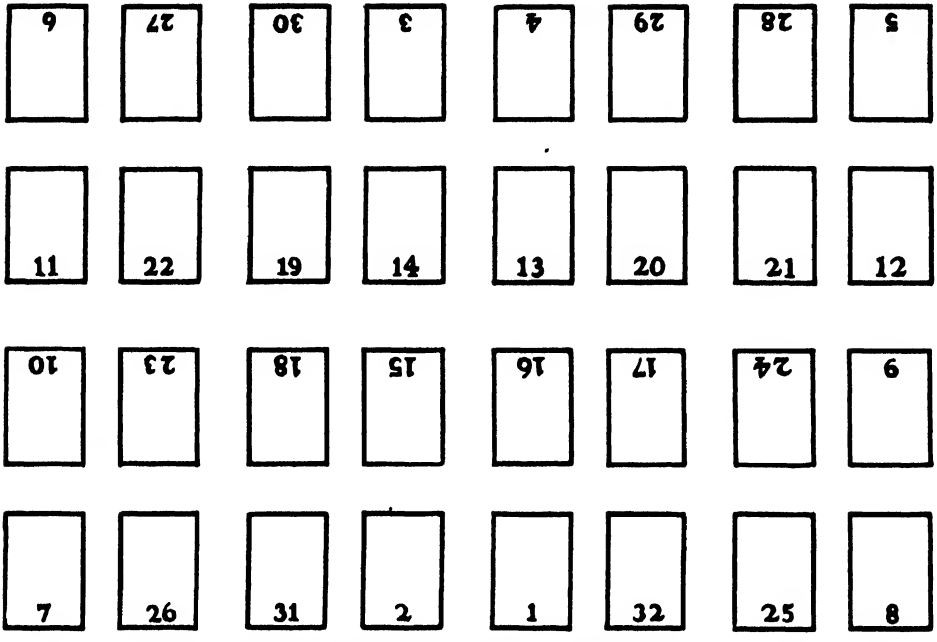
PRING, MARTIN. See NEW HAMPSHIRE (History).

PRINTING. While the Chinese invented and used printing of one sort and another for hundreds of years before it was dreamed of elsewhere, its history, as far as it concerns us, dates from about 1450, when Johannes Gutenberg began printing from movable type in Mainz, Germany. There are some who claim that Laurens Coster, of Holland, was the real inventor of the process, but, regardless of who first thought of it, Gutenberg seems to have been the man who developed it to the point where it could be used to produce artistic and readable, as well as relatively inexpensive, books. In fact, so well did Gutenberg and his companions work out their methods that his printing will stand comparison with the best that is done to-day. There was little real improvement in the method of doing the typesetting and presswork until over three hundred years later. From Germany the art quickly spread into Italy, France, and Spain, and in 1476 William Caxton introduced it into England.

The first printing press in America was set up in Mexico in 1536. The first press in the United States was installed at Harvard College in 1639, and has since grown to be the great University Press of Boston. Since its beginning, printing has steadily grown in importance, until to-day the value of the printed matter produced in the United States alone each year is nearly three billion dollars, and it is now so much a part of our life that it is hard to imagine civilization without it.

The Process. The first step in producing printed matter is known as *composition.* It consists in setting up the type to form words, and spacing these words into lines of equal length. Type is made of lead, mixed with tin and antimony to harden it, and is cast in the form of little sticks, about an inch long, and wide and thick enough for the letter which appears at one end.

To set type by hand, the *compositor,* or typesetter, stands before the *case*—a shallow, wooden box, divided into as many compart-



HOW A FORM OF THIRTY-TWO PAGES IS PREPARED FOR THE PRESS

After this form is printed, the ink is allowed time to dry, after which the other side of the sheet is printed from the same form Then the sheet is cut through the center, between pages 1 and 2, before folding Therefore the sheet produces sixty-four printed pages, or two identical sets of a thirty-two page booklet

ments as there are letters and characters; he picks out the letters one at a time, and sets them in order in a small metal frame called a *stick*, which he holds in his left hand. As each line is set up, he spaces it out by inserting thin strips of lead between the words so that each line is the exact length of the stick. When ten or fifteen lines have been set in this manner, the stick is full, and the type is transferred to the *galley*, a shallow metal tray slightly wider than the column of type and perhaps twenty inches long. This process is repeated until the galley is full or the whole article has been set up.

Proofreading. The type is then inked, and an impression is made upon a long strip of paper. This is called the *galley proof*. It is given to the proofreader, who compares it with the original manuscript (called the *copy*). All the errors which the proofreader finds are marked on the margin of the galley proof, which is given back to the compositor, who corrects the errors.

Hand composition was the only method used until about 1890. It is still used in setting advertisements containing a great variety of sizes and styles of type, and also for similar work which cannot be produced by machines. Practically all books, magazines, and newspapers are now set up on either the *linotype*, which casts type from brass matrices in the form of a slug (or "line o' type"), or on the *monotype*, which casts and sets up the characters one at a time. See LINOTYPE; MONOTYPE.

Makeup. The type, whether set by machine or by hand, is next made up into pages. The printer takes enough type from the galley to make a page, adds whatever is needed in the way of a heading, a page number (*folio*), rules, photo-engravings, ornaments, etc.; and spaces the combination to the correct size by inserting strips of lead, wood, or cardboard.

Lockup. The pages (from which page proofs may now be taken and sent to the customer for his approval) are next locked up in iron frames (*chases*), in which the type is held tightly by means of wooden blocks (*furniture*) and iron wedges (*quoins*).

If the job is to be printed from the type, which is done if only a few thousand copies are wanted, a number of pages are locked in one large *chase*, the pages being arranged so that when they are all printed on one sheet of paper and that sheet folded, the pages will be in the right order. If, however, the work to be printed is a great newspaper or some popular book or magazine, of which several hundred thousand copies may be printed, the pages are locked in smaller chases holding only one to four pages, and are then electrotyped or stereotyped (see ELECTROTYPING; STEREOTYPING); that is, the type is duplicated by



How World Book Pictures in Many Colors are Printed. As many as ten varying colors are shown in the two bottom illustrations, but only four plates, engraved for four colors—yellow, red, blue, and black—were employed. These are numbers 1, 2, 4, and 6, counting from the top. First, the paper receives the impression of the yellow plate. Second, the red-inked plate is printed with exactness over the yellow; the result appears in the third row. Next, the blue-inked plate is printed over the combination of yellow and red, the effect appearing in the fifth row. Lastly, the plate to be printed in black is put on the press, and it is impressed over the combination of yellow, red, and blue, giving the complete, satisfying multi-colored final effect.

pressing it into a soft material (wax or paper pulp) and using the mold thus produced to make metal plates which are exact duplicates of the surface of the original type.

If plates are made, they are arranged, like the type pages, so that the pages will come in the correct order when the sheet is folded. As many as sixty-four pages may be printed on a single sheet of paper, but thirty-two is a more usual number. The group of type pages or plates so arranged is called a *form*, and the group of pages which results when the sheet has been folded is known as a *signature*. (In this set of books, signature numbers appear on every sixteenth page. See pages 17, 33, etc.)

Presswork. The printing press is merely an arrangement for pressing the paper firmly against the inky surface of the type. In the early presses, the ink (a thick mixture of linseed oil and lampblack) was applied by hand, a sheet of dampened paper laid on the inked form, the pressure applied, and the sheet removed by hand; this was a slow and laborious process. In the modern press, the ink is automatically applied by rollers, the paper is fed in by machinery, the pressure is applied by great cast-iron cylinders, driven by electricity, and the sheets are removed and (in many cases) folded mechanically at high speed, with very little attention. See PRINTING PRESS.

Illustrations. The pictures which are so beautifully printed to-day are reproduced by a number of methods. The earliest process was the wood cut, which was made simply by drawing the picture on a smooth block of wood and then cutting away the parts which it was wished to have white in the finished print. When this block was inked and pressed against the paper, the raised parts printed, reproducing the design. This process was raised to a very high state of perfection during the nineteenth century. The Japanese have used it to produce some really remarkable colored prints, sometimes using over a hundred blocks to apply the different colors of a single picture. To-day it is still employed by artists, but is of little commercial importance, having been replaced by photo-engraving.

Photo-engravings are made by producing, photographically, an acid-resisting image of the picture on the surface of a zinc or copper plate, which is then eaten away with acids to leave the picture in the form of a raised pattern. If the picture consists merely of solid black lines or masses on a pure white background, the engraving is called a *line cut*, or *zinc etching*. If it is wished to reproduce grays of different shades, as well as black and white, the picture is broken up by a screen in the camera, so that the image on the copper is a series of tiny dots, largest where the picture is darkest, smallest where the tints are lightest. The engraving is then known as a *halftone*. Either line cuts or halftones may be used to produce colored pictures, but if line cuts are used, it is necessary to use, as with woodcuts, one engraving for each color. Accordingly, these are used only to reproduce artists' drawings especially made for the purpose, as the cost of enough plates to reproduce a bunch



SMALL JOB FORM READY FOR THE PRESS

(1) The chase, a metal frame capable of resisting pressure (2) Quoins, or locks (3) Wood strip, or reglet, to help fill space between type form and the chase. (4) Metal furniture, used for same purpose as the reglet (5) Bearers, metal strips, laid by the side of the type (6) The type form.

of flowers, for instance, in their natural colors would be enormous, and the results none too satisfactory, at best.

With the halftone plates, however, it is possible to reproduce any colored object in four printings, by what is called the *four-color* process. For this, four pictures are taken of the object to be reproduced, and by the use of color screens in the camera, these are so taken that one of them is a picture of the reds, one a photograph of the blues, and one a photograph of the yellows. Halftone plates are made of each of these, and are inked, one with red, one with blue, and one with yellow ink, and printed, one exactly on top of the other, on the same sheet of paper. The fourth plate, which is inked with black ink, is added to give depth to the shadows and sharper outlines. It may, however, be omitted, and often is in cheaper work, as the red, blue, and yellow inks are capable of producing any color, including black, by mixing in different proportions. Thus, greens are produced where the yellow and blue dots appear; purples, where the red and blue dots are mingled; orange, where the red and yellow are mixed, and so on.

Other Kinds of Printing. While the processes described are the ones commonly employed to produce books and magazines, they are by no means the only ones used. In addition to the sort of printing described (which is called

relief printing, because the parts which carry the inky image are in relief—that is, higher than the surrounding material), there are two other important classes: namely *planographic* and *intaglio* printing.

Planographic Printing is done from a surface on which the pattern (type, pictures, etc.) to be printed is not raised above the surrounding material, but is chemically produced by a treatment which causes the pattern to attract ink and the surrounding surface to repel it. In this class we find *lithography* (see LITHOGRAPHY), which is done from stones or flat metal plates, slightly roughened, and *collotype*, which is done from a gelatin surface on which an image is photographically produced. The very finest of colored reproductions are made by collotype (known as *gelatin printing*, *heliotype*, and a number of other names), but the process is very expensive, very slow, and can only be handled by highly skilled workers. Much the same things can be said of lithography from stones. Accordingly, the only one of these planographic processes of great commercial importance at present is the variation of lithography known as *offset* (see OFFSET PRINTING).

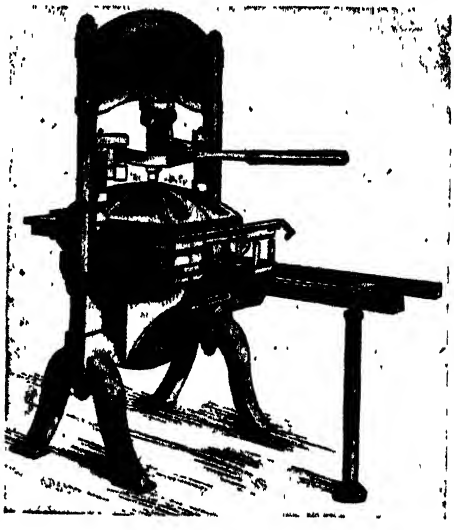
Intaglio Printing includes all forms of printing in which the ink is carried in pits or grooves in the surface of a smooth plate. The paper money printed by the government, the etchings, aquatints, and engravings produced by artists, engraved calling cards, letterheads, and announcements, and many illustrated magazines are printed by intaglio processes. One of the most important members of this class is *rotogravure*, which is produced from copper cylinders.

The design in "roto" is etched into these cylinders by acids and is made of tiny pits, the pits being deepest where the picture is darkest on the press. This copper cylinder revolves in a trough of thin ink which fills the pits. The surface is scraped clean by passing under a thin steel blade, and the paper, fed from a roll, is pressed into the inky hollows. The deep, velvety tones which can be produced by this method make it very popular for reproducing pictures. Most of the larger newspapers now have rotogravure supplements printed in this way. Lately, efforts are being made to apply the process to color work, either by printing three or four colors by gravure, just as in the four-color halftone process, or by printing the first colors by offset and adding a final color by gravure, this final color giving a depth and richness of color which it is hard to get by offset alone. Some excellent color work is now being done on *modified rotogravure presses which feed sheets* of paper (instead of from a roll), and print from thin copper plates wrapped around an iron cylinder. W.P.T.

Related Subjects. The reader is referred in these volumes to the following articles:

Books and Bookbinding	Newspaper
Caxton, William	Offset Printing
Electrotyping	Printing Press
Engraving	Stereotyping
Gutenberg, Johannes	Type
Lithography	Wood Engraving

PRINTING PRESS. A printing press is a machine for pressing a sheet of paper against an inked surface. The earliest presses did just that, and nothing more. They were built like the medieval cheese press, in which a wooden block was pressed down upon the cheese

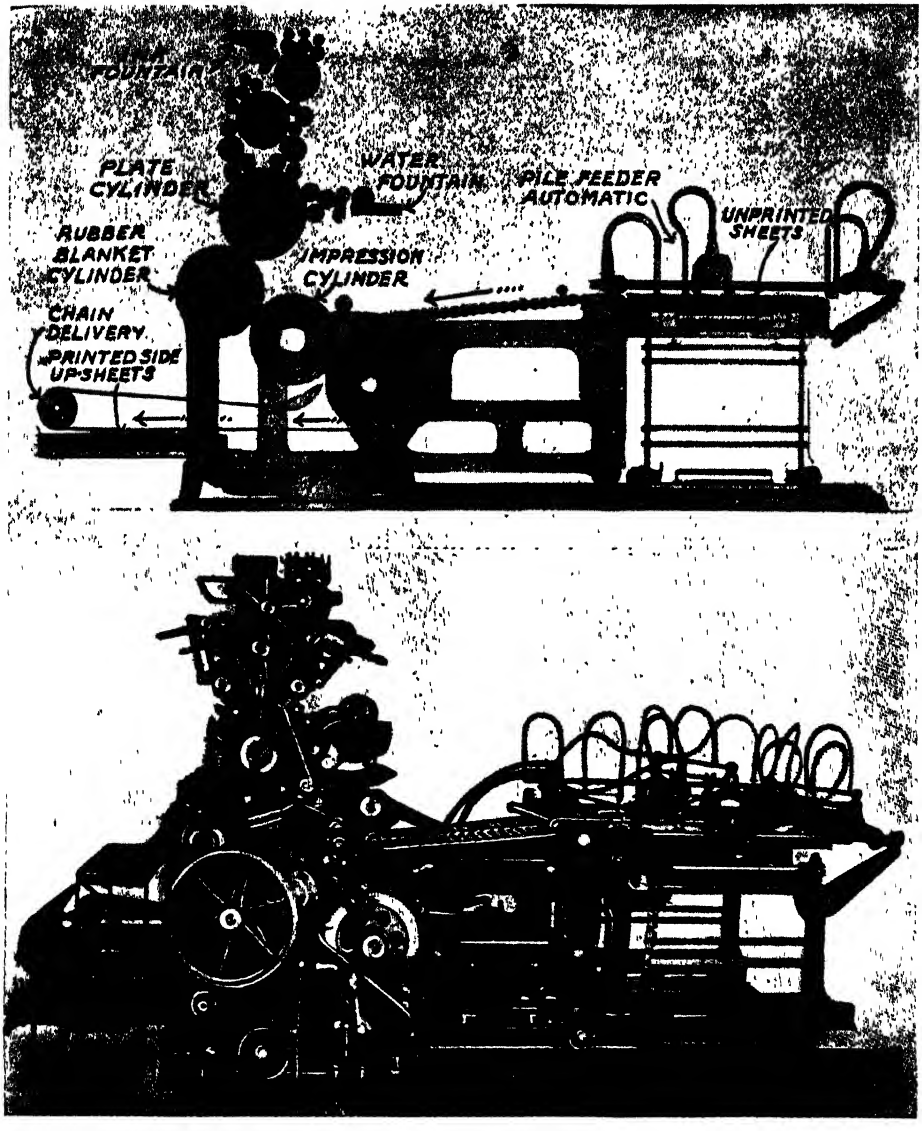


"WASHINGTON" HAND PRESS

Hundreds of country newspapers in the past were printed on this style of printing press; few now are in use It is capable of producing a fair grade of work and is an inexpensive machine To it was due the rapid increase in the number of newspapers in small villages.

by means of a large wooden screw. The screw was tightened by means of a lever passed through a hole in one end. For printing, a form of type or engraved block of wood was inked (by means of leather-covered balls) and placed on the bed of the press, a sheet of damp paper was laid on it, and the wooden block was screwed down until the pressure was great enough to make a clear impression. The screw was then turned in the other direction until the form could be removed; the paper was lifted from the form and set aside to dry or to wait for the printing on the other side, and the process was repeated. The process was very slow and tiresome, but there was little improvement in any but minor details *until this press had been* used for more than two hundred years.

In 1804, however, Charles, third Earl of Stanhope, invented an iron press which exists



AN "OFFSET" PRINTING PRESS, WITH DIAGRAM OF PARTS

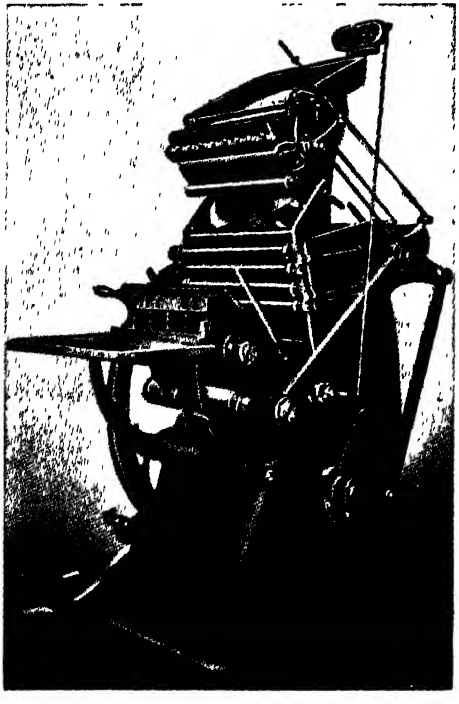
[See the article OFFSET PRINTING.]

to-day in a slightly modified form as the "Washington hand press." Presses of this type are still found in many printing plants, both in America and England, although, except in the very smallest shops, they are used only for pulling proofs and similar odd jobs.

From this time on, progress was rapid. In 1806 a German, Friedrich König, invented a power-driven press in which a revolving cylinder instead of a flat plate was used to press the paper against the form. Two of these presses were purchased by the London *Times*, and that newspaper was printed at the rate of 1,100 impressions per hour. As 400 impressions per hour had been about the maximum with the older machines, this speed caused great astonishment.

During the latter part of the nineteenth century, too, printers found out how to print on dry paper with a hard "packing" (see below). In all early printing, the sheets had to be soaked in water, as the type, paper,

and platen were all so uneven that unless the paper were softened and the type actually forced into it, a good impression could not be made. To help this process, sheets of soft paper, the packing, were laid between the



A MODERN PRESS FOR PRINTING SMALL SHEETS

platen and the dampened sheet. This process gave a strong, clear impression, but the type punched into the paper so that the sheets had to be flattened in a press before they could be bound. As the presses were improved, and as type and paper became more uniform, it became possible to print with less packing and without dampening the paper. Practically all modern printing is done in this manner. For successful results, it requires a very careful *make-ready*, or preparation of the impression cylinder, which must be built up by pasted bits of tissue paper so that the heaviest pressure comes in exactly the required places and is removed from any points on the form which tend to cut through the paper.

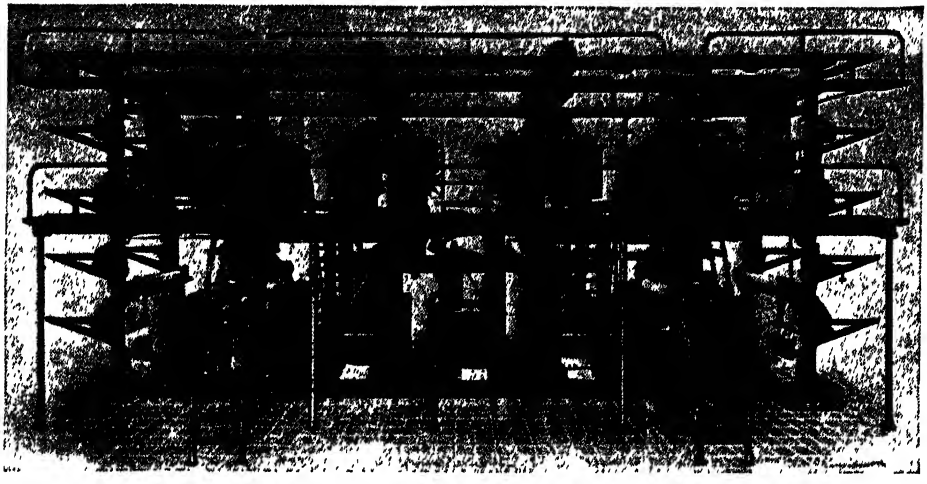
Modern Presses. Modern presses are of three kinds: the *platen* press, in which a flat surface is used to press the paper against the type; the *cylinder*, or *flat-bed*, presses, in which the paper is pressed against the flat type or plates by an iron cylinder; and the *rotary* press, in which the impression is made by a cylinder, as in the flat-bed press, but in which the type is replaced by curved stereotype or electrotype plates, which are fitted around a second cylinder.

Presses are also classified as sheet-fed or as web presses, depending on whether the paper is fed from a pile of sheets or from a roll. Most rotary presses are web presses—that is, they print on a continuous wide ribbon of paper, fed from a roll which may contain four or five miles of paper. Most platen and flat-bed presses are sheet-fed.

Platen Presses. The only platen presses in use to-day are small machines, used for jobs which are printed in small quantities—such as hand bills, programs, letterheads, and similar "job printing," as it is called. The most common press of this type is the Gordon, found in almost every printing plant which does general work, and often the only press used by the small shop. It will produce about 1,000 impressions per hour, is ordinarily fed by hand, and may be operated either by foot power or a small electric motor. The ink is applied to the flat circular plate at the top and is carried down to the type by gelatin rollers.

Cylinder Presses are used for the great majority of book work and fine color work. Small catalogs, magazines, and pamphlets are also printed on them—in fact, most of the high-grade printing done to-day is done on presses of this type. Some of these machines are built so that they will print both sides of the sheet at one passage through the press. These are called *perfecting* presses. Others are built to print two colors, one on top of the other, at each passage through the press, and are used for producing color work. These are called *two-color* presses. The common type of cylinder press used in the United States is called a *two-revolution* press, because the cylinder revolves twice for every impression. That is, the cylinder revolves once while the type is passing under it and the sheet is being printed, and then revolves again to deliver the sheet while the type is passing back in the opposite direction and is being inked. The sheets of paper ordinarily handled by cylinder presses are from two to six feet long by one to four feet wide. They are generally fed and delivered automatically.

Rotary Presses. The largest, fastest, and most amazing presses built to-day are the rotary presses, and of these the most spectacular are the ones built for newspaper printing. These newspaper presses are really not single presses, but groups of presses, a large number of units being set up so that various combinations can be run as a single machine; the mechanism is provided with machinery for cutting apart and folding the printed sheets, which are then ready for delivery as completed newspapers. This possibility of changing the way in which the units are combined in



DOUBLE SEXTUPLE PRESS WITH SIX HIGH-SPEED FOLDERS

Size: 37 ft 3 in long, 7 ft 10 in wide, 18 ft 7 in high, horse power, 150.
Capacity 216,000 per hour, 4, 6, or 8-page papers; 144,000 per hour, 10 or 12-page papers; 108,000 per hour, 14 or 16-page papers, 54,000 per hour, 28 or 32-page papers, 72,000 per hour, 18, 20, 22, or 24-page papers

printing makes it possible to print editions of the paper containing varying numbers of pages. Thus, one large newspaper has a press room containing thirty units, which may be used to print papers of from eight to forty pages. Such a press room may turn out well over a million twenty-four page papers in a single night.

All the modern rotary presses use paper at a tremendous rate. A single press recently built for printing bread wrappers in four colors uses paper eighty-one inches wide at a speed of 48,000 feet per hour; that is, a strip of paper more than nine miles long is printed every hour, in four colors. Smaller sheet-fed presses, built for printing envelopes, office forms, letters, and similar work, turn out over 8,000 impressions per hour—more than two each second.

In newspaper presses, where many similar units are built to run as one press, the amount of paper used and the speed with which finished papers can be produced seem limited only by the number of units which the owner wishes to buy. The units may be run at the rate of 300 impressions per minute, and a single paper may use as much as 400,000 pounds of newsprint per issue.

It is the modern rotary press that makes it possible to produce newspapers, telephone directories, mail-order catalogs, magazines, wrappers, and similar printing so cheaply and so fast. As the quality of rotary-press printing improves, its use, already widespread, constantly increases, and it seems probable that in the future much of the printing now done in large shops on flat-bed presses will be done on rotaries. W.P.T.

Related Subjects. See list at end of the article PRINTING.

PRIORY, a monastic house. See MONASTICISM.

PRISCILLA MULLINS. See COURTSHIP OF MILES STANDISH; PLYMOUTH COLONY; STANDISH, MILES.

PRISM, *priz' 'm.* A solid which has two equal and parallel polygons for its bases and parallelograms for its lateral surfaces is a *prism.* A prism whose lateral faces are perpendicular to the base is a *right prism*; the lateral faces

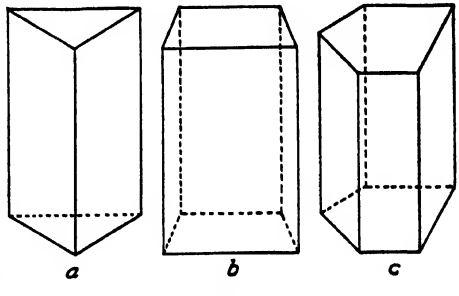


FIG. 1

Explanation of the three figures appears in the text.

are rectangles. All of the prisms shown in Fig. 1 are right prisms. Other prisms are called *oblique*; their lateral surfaces are parallelograms but not rectangles. Prisms are named from their bases; as *triangular*, *a*; *rectangular*, *b*; *pentagonal*, *c*, etc. (see in Fig. 1). The *altitude* of a prism is the perpendicular distance between the bases.

The *lateral surface* is made up of a number of parallelograms, a number equal to the num-

ber of the sides of the base. Therefore *the area of the lateral surface is found by multiplying the perimeter of the base by the altitude.*

The volume of a prism is found by multiplying the area of the base by the altitude.

Problems. 1. What is the entire surface of a prism whose base is 2 inches square and whose altitude is 6 inches?

Lateral area in sq. in. $= (4 \times 2) \times 6 = 48$
Area of bases in sq. in. $= 2 \times (2 \times 2) = 8$
Entire surface in sq. in. $= 56$

2. What is the volume of a triangular prism 20 inches high, whose base is a right triangle with a base of 12 inches and an altitude of 8 inches?

Area of base in sq. in. $= 12 \times \frac{8}{2} = 48$
Volume in cu in. $= 48 \times 20 = 960$

3. What is the volume of a prism whose altitude is 15 feet and whose base is a regular hexagon 2 feet on each side?

Solution (1) See base as a regular hexagon divided into six equal triangles. (2) Draw altitude of one of these triangles, dividing the t iangle into two right triangles (3) We have base and hypotenuse of right triangle, to find altitude.

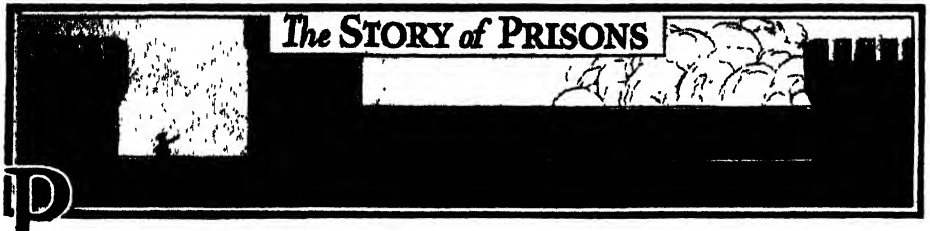
(4) Base $= 1$ ft.
Hypotenuse $= 2$ ft.
$H^2 = B^2 + A^2$
$2^2 = 1^2 + A^2$
$3 = A^2$
$\sqrt{3} = A$
$1.73+ = A$

(5) Area of hexagon in sq ft $= \frac{(6 \times 2) \times 1\ 73}{2} =$ 10 38.

(6) Volume of prism in cu. ft. $= 15 \times 10\ 38 = 155.70$

4. What is the lateral area of a silo built in the shape of a hexagonal prism 30 feet high, each side of the base being 6 feet 8 inches long?

Lateral area in sq ft $= (6 \times 6\frac{2}{3}) \times 30 = 1200$. J.W.Y.

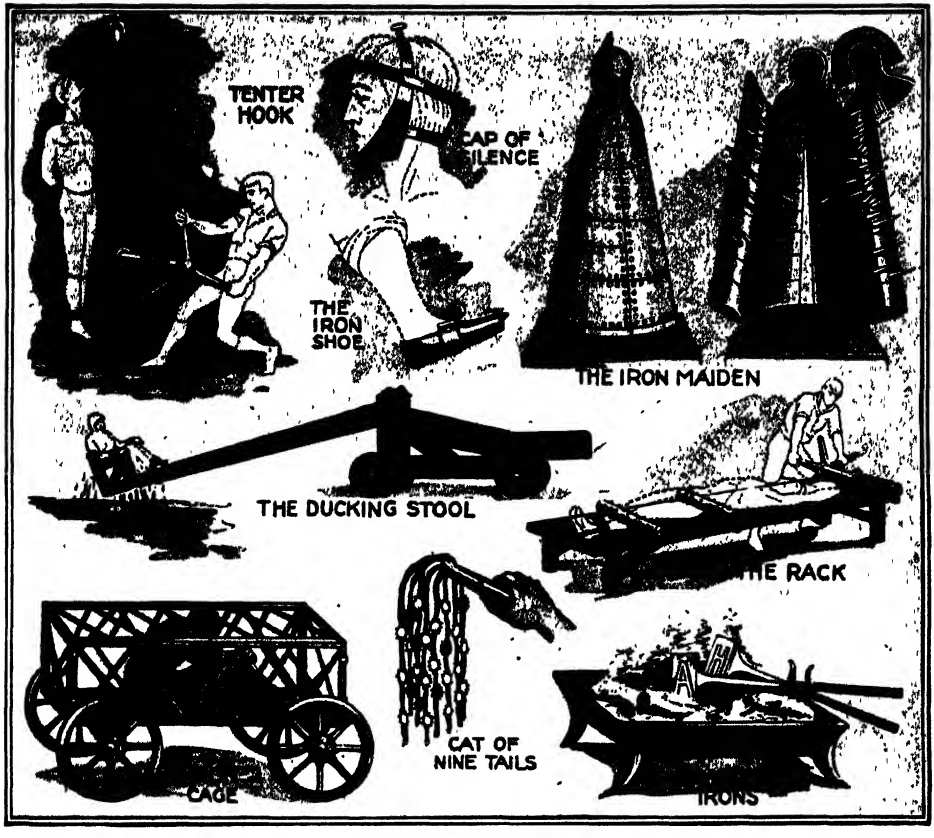


PRISON, *priz'n.* The word *prison* reached its English form through the Latin and the French languages. Originally, it meant *to lay hold of*, or *to seize*; a prison, therefore, was any place where persons were held in safe custody after being accused, to assure their appearance at a trial. It was not thought of as a place for the punishment of a crime, for death or physical torture was usually considered the only just retribution for a wrongdoing. It was not until later that lesser penalties were considered, and not until the sixteenth century that workhouses were provided for vagrants. The early prisons were nothing more than dark dungeons infested with vermin, and without ventilation. Literature is full of gruesome tales of these old prisons. Byron's descriptions in his *Prisoner of Chillon*, and the prison scenes in Dumas' *Count of Monte Cristo*, are examples.

John Howard, an English philanthropist, wrote an account of the conditions of state prisons in the latter part of the eighteenth century, and stirred the people to reform. He devised a plan for prisons, particularly penitentiaries, in which he proposed to keep all the prisoners in separate cells under close observation, and to provide them with useful labor to be done in their cells. By this seclusion and solitude, he hoped to reform the inmates. Up to this time, there was no distinction between jails and penitentiaries, and the idea that a criminal might be reformed was a real innovation Contrasted with this idea, we have to-day the objective of "reform, not punishment; training, not simply restraining; good citizens, not merely good prisoners."

To-day a jail is a purely local institution, maintained for the temporary safe-keeping of a person accused of crime until his guilt or innocence is established, and as a place of imprisonment for those convicted of petty offenses who are sentenced to a few days' or a few months' detention. A prison, or penitentiary, is not a town, city, or county institution, but is a part of the machinery of government of a state. It is not a place for detention of petty offenders or youthful criminals, but for the imprisonment of adults, both male and female, who have been found guilty of serious offenses against society and who have been sentenced for periods varying from one year to the remainder of their lives. In jails, short-term prisoners are maintained in idleness; in prisons, labor is provided, and each inmate works at a productive task, under strict discipline.

Management. Every state prison is in immediate charge of a *warden*, who nearly always receives his appointment from the chief executive of the state; in a few instances a board of prison control assumes this responsibility. Until within recent years, wardens were appointed largely as rewards for political activity, regard-



METHODS OF TORTURE ONCE USED IN PRISONS

less of fitness; this rule yet holds in some parts of America, but the awakening consciousness of the people is bringing about a notable reform. Fewer incompetent wardens are now in charge of prisons than ever before; men who have made prisons a subject of long study are being placed in these important posts, and scientific management is changing the character of many institutions.

Under the warden are numerous *guards*, who are armed officers, charged with the task of maintaining order and enforcing discipline. There is a prison *chaplain*, appointed by the governor or by the warden; his work is of vast importance, and frequently more far-reaching in its effect than the coercive regulations of the institution.

Equipment. Every prison has its large number of cell rooms, constructed tier upon tier and built of concrete and iron. In some of the new prisons, as at Stateville, Ill., cells are provided with hot and cold water, toilets, a table and chair, and the cots are covered with white spreads. The most modern idea tends to the cottage plan for prisoners, but this requires a large area for the entire prison plant. There is always a prison library, usually well stocked; a chapel, for church services and for entertainments; a barber shop; a laundry; and a fairly large space for athletic contests, open at specified times to prisoners whose conduct is exemplary.

Occupations of Prisoners. If idleness is the greatest vice of free men, it is the worst possible condition under which men in prison can live. Labor is enforced in every penal institution. Each man is given work, if possible, similar to his occupation when he was "outside." In some prisons, the men are paid a small sum for their work; in others, they are paid for overtime only. Occasionally, after regular hours inmates are permitted to work at any chosen private task, and thus earn money. All earnings are either held to the credit of prisoners by the warden or are sent to their families or other relatives, as may be requested.

In some prisons, what is known as the convict-labor system is in force. It is explained in the article CONVICT LABOR.

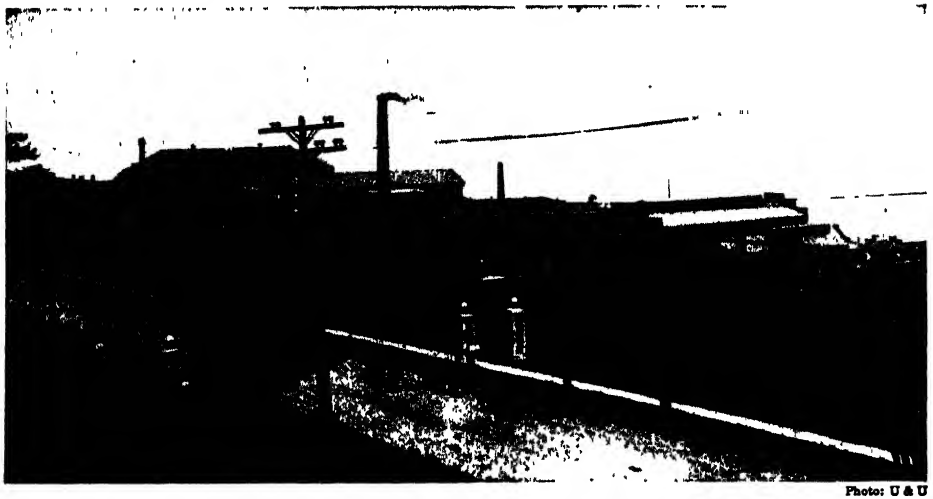


Photo: U & U

THE FAMOUS SING SING PRISON, NEW YORK

Prison Reform. It is difficult to imagine the horror of solitary confinement in a poorly lighted, ill-ventilated, concrete cell, where the prisoner can see no person save a guard, and is forbidden to speak even to him. Such was once the conception of what prisons and punishment should be. When it was found that such places were becoming madhouses, reforms slowly appeared. Work was given the victim in his solitude, but even this mental stimulus did not prevent madness. It was at length realized that man, a social being, must have at least some degree of intercourse with his fellow men.

The prison workshop was then introduced, and prisoners worked together, under orders not to hold communication with one another. This strict rule is yet in effect in most prisons, but its enforcement is difficult; prisoners shrewdly arrange codes and signals, and use them even under the eyes of guards, so ingenious are some of them.

Well-behaved prisoners in the better class of institutions are given privileges which enlarge their freedom of movement, extend to them certain conversational privileges, and in general put them on their honor. These are termed *trusties*, and few thus favored fail to meet the expectations of officials. Prison farms, or honor farms, are frequently established, and on these, trusted prisoners live and enjoy a good degree of freedom. Another recent departure from the iron rule of prison management is the organization of prison camps, to which are assigned trusted prisoners, to construct public roads. Cases are known in which 150 prisoners have occupied such camps, with fewer than half a dozen guards to watch them. Betrayal of confidence in such cases is rare.

Among the American prisons in which reforms have raised the standards of conduct and of living are the state penitentiaries of Colorado, Oregon, and New York (Elmira). Illinois attempted to enlarge upon the honor system, and for a year or more succeeded fairly well; but abuses arose from various sources, and while an honor farm is yet maintained, freedom of action is now more restricted. In Sing Sing (at Ossining, N. Y.) and a few other prisons, discipline is effected quite successfully through the system of inmate-community organization.

Other noted and long-neglected reforms are the psychiatric and medical clinics, whereby many criminals are reclaimed by hospital attention.

Punishment for the crime of the prisoner is the foremost consideration in securing the ends of justice, but the era has arrived which marks him as a man worth reforming and remaking into a good citizen. While many have sincerely tried, there are, perhaps, not more than fifty men in America who have succeeded in instituting helpful and beneficial reforms of a permanent nature into prison management.

The essentials agreed upon by the present students of prison reform include the separation of prisons and prison officials from politics; discipline which will encourage self-control and strengthen character; an educational system which will provide instruction in common-school subjects and trade education, under competent teachers; the use of mental tests for work assignment, education, discipline, discharge or parole, and for segregating the unfit; the provision of as much outdoor work as possible, and sufficient exercise and wholesome recreation; the passage of indefinite-

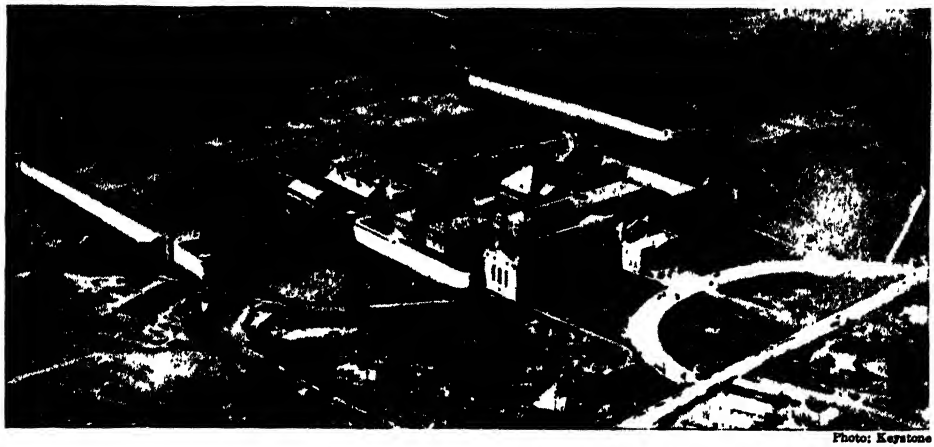


Photo: Keystone

THE FEDERAL PRISON AT ATLANTA, GEORGIA

sentence laws, so that prisoners will be kept in confinement until they are proved fit for release; and reform of parole system, embracing follow-up work and after-care of paroled prisoners.

Related Subjects. The reader is referred in these volumes to the following articles

Convict Labor	Juvenile Court
Crime	Parole
Indeterminate Sentence	Sociology

PRISONER OF CHILLON, *shil lon'*, or *she yoN'*, a poem by Byron which tells the story of Francis Bonnivard. See CHILLON.

PRISONERS OF WAR, those soldiers or naval men who have been captured by the enemy while enlisted under the banner of a country at war. It is not necessary that they be actively engaged in fighting, if they are engaged in any capacity with an army, as guides, sutlers, or electricians, they are liable to capture, though surgeons and chaplains are usually exempt from seizure.

In ancient times, prisoners were treated with great cruelty. An Assyrian inscription speaks of the crucifixion of 3,000 such unfortunates. But as civilization advanced, higher ideals slowly developed, until at present, among all enlightened nations, prisoners of war are treated even more considerately than are prisoners in civil life. According to a convention of the Peace Conference at The Hague, in 1907, they are simply in the custody of the nation that captures them, and while confined they are to be treated as well as that country's own soldiers. They may be put to work, but must be paid for their labor, and the work must be no more arduous than that performed by the soldiers of the power holding them. Officers are to receive the same pay that was allowed them by their home government. The captors have the right to prevent any prisoner from communicating with anyone whomsoever, and of reading all correspondence sent or received by prisoners. If a prisoner tries to escape, he may be shot or disciplined. If, however, he succeeds in escaping, rejoins his own forces, and is again captured, he cannot be punished for his previous offense.

Conditions in the field, however, are different from those laid down on paper at The Hague. In the World War, many stories were circulated to the effect that some of the warring nations treated their prisoners of war very harshly. Because of their great numbers, their care naturally imposed a very heavy burden, and it is probable that there was more suffering among the captives than had ever before been recorded.

The internment of large numbers of civilians had not been contemplated by the framers of The Hague regulations. Accommodations for the civilian prisoners were at first definitely bad, but were gradually improved in most prison camps, largely through the efforts of the prisoners themselves.

Repatriation of military prisoners of war and release of interned civilians began immediately after the Armistice was signed, but, owing largely to transport difficulties, it was several months before the undertaking was completed.

PRIVATEER, *pri va teer'*. When two nations are at war with each other, the commerce of one is subject to attack by the other. In early times, it was the custom for hostile nations to commission privately owned ships of a neutral nation to assist them in war on the ocean commerce of their enemy. Such commissions were known as *letters of marque*, and ships acting under them were regarded as privateers. But this practice was open to great abuse, and was contrary to the developing sense of justice among all peoples. Accordingly, a conference at Paris in 1856, attended by representatives of the leading nations, declared that privateering should be abandoned.

The United States did not sign this convention because its terms were not wide enough; that it accepted the principle was shown in its declaration of war against Spain in 1898, when it announced that privateering would not be permitted. The navies of the nations are now the only instruments of offense and defense on the high seas.

The *Alabama*, built and fitted out in an English port in 1862, and used by the Confederacy to prey on Union shipping, was a privateer The fact that England permitted the construction of the vessel was regarded by the United States as a breach of international law, and this contention was sustained in 1872 by a court of claims.

Related Subjects. The reader is referred in these volumes to the following articles.

Alabama, The	Revolutionary War
Marque and Reprisal	War of 1812
Navy	War of Secession

PRIVILEGED QUESTION. See PARLIAMENTARY LAW.

PRIVY, *priv' ie,* **COUNCIL,** in Great Britain, a council appointed by the sovereign. Originally, its purpose was to advise him on matters of state. Its beginning can be traced to the council of William the Conqueror. In subsequent centuries, as Parliament increased its power, the importance of the Privy Council decreased. The contest between Parliament, which claimed sole power to legislate, and the Crown, which claimed power to legislate through the Privy Council, was definitely settled only by the Bill of Rights, in 1689.

The Cabinet of Great Britain is a development of the Privy Council; that is, the former began as a select few of the larger council, whom the sovereign especially trusted. The Privy Council at present, besides the Cabinet, is composed of a large number of eminent persons, such as retired ambassadors, judges, and distinguished scholars, selected from all parts of Great Britain and its dependencies. For many of them it is simply a title of great honor, for a Privy Councilor, as such, receives no salary; it is only in the event that he is called to a place in the Cabinet that he becomes a salaried official. The Lord President of the Council is a member of the Cabinet.

Members of the Council are appointed for the life of the sovereign who names them, and for six months after the ruler's death, unless for some cause stricken from the roll. The full Council seldom meets, except at the beginning of a new reign, or when the reigning sovereign announces his or her marriage.

Formal meetings of the Council are attended by the few councilors concerned with the orders to be issued. The administrative work has always been done through committees, which are now state departments, each presided over by a Minister responsible to Parliament.

A member of the Privy Council prefixes the title Right Honorable to his name and follows the name with the suffix P. C. (Privy Councilor); this latter title precedes any other with which the member may have been honored.

The Cabinet of the Dominion of Canada is called His Majesty's Privy Council for Canada, but only such of its members as have been so appointed belong to the Privy Council of the Empire.

Related Subjects. The reader is referred in these volumes to the following articles.

Bill of Rights	Great Britain
Cabinet	(Government)

PRIVY SEAL, an official seal once used on public documents in Great Britain. It was intermediate in character between the Signet Seal, that is, the seal used as the signature of the sovereign, and the Great Seal, or the seal used on all public acts of state which concern the United Kingdom. The privy seal was used to authorize the issue of money from the exchequer, or to authenticate documents to the Keeper of the Great Seal, thus authorizing him to affix the latter, and it served to authenticate documents of minor importance. Since 1884 its use has been discontinued, but the office of Keeper of the Privy Seal still exists. His official title now is Lord Privy Seal and Leader of the House of Lords. The holder of the title is the third Minister of the Cabinet. See CABINET; GREAT BRITAIN (Government).

PRIX DE ROME, *pre' deh rome.* See ÉCOLE DES BEAUX-ARTS.

PRIZE FIGHTING means fighting with fists, for a prize or reward. Formerly, the fighters used bare fists, but they now wear padded gloves. Prize fighting of to-day is peculiarly an Anglo-Saxon sport, but ages ago it was practiced by other nations, especially the Greeks and Romans. After the fall of Rome, however, boxing seems to have died out, except in England, where professional fighters were known throughout the Middle Ages. Modern prize fighting begins with James Figg, a fighter who defeated all comers in England from 1719 to 1730. One of his successors was Jack Broughton, who made boxing a national sport. He first used gloves, but only in practice. All prize fights were fought with bare knuckles until more than a century later. The last great prize fight of this old style was fought between Tom Sayers, the English champion, and J. C. Heenan, the American champion, in 1860. These fights were so brutal that public opinion finally called a halt.

Prize fights to-day are conducted under the regular rules for boxing (which see). They lack the brutality and the trickery and cheating which characterized the bare-fist fights of an earlier day, but many people still regard them

as degrading exhibitions. Some states forbid prize fights, or public boxing exhibitions of any kind; some allow "sparring matches," but not for prize money; in a few states only are there no restrictions.

American Heavyweight Championships. Following is a list of American heavyweight champions:

Tom Hyer	1841-1849
Yankee Sullivan	1849-1853
John Morrissey	1853-1857
John C. Heenan	1857-1863
Joe Coburn	1863-1865
James Dunn	1865-1866
Mike McCool	1866-1869
Tom Allen	1869-1876
Joe Goss	1876-1880
Paddy Ryan	1880-1882
John L. Sullivan	1882-1892
James J Corbett	1892-1897
Robert Fitzsimmons	1897-1899
James J Jeffries	1899-1905
Marvin Hart	1905-1906
Tommy Burns	1906-1908
Jack Johnson	1908-1915
Jess Willard	1915-1919
Jack Dempsey	1919-1926
Gene Tunney	1926-1928

In 1928, a few days after Tunney's victory over Tom Heeney, the world champion unexpectedly retired from the ring, preceding his marriage.

PROBABILITIES, sometimes spoken of as the *theory of averages*, plays an important part in the affairs of men. Life insurance companies are tremendously interested in probabilities, although mortality tables have taken the place of mathematical determinations. In the early part of the eighteenth century, De Moivre, a well-known mathematician of London, constructed a mathematical formula for determining the expectation of life, which he said would be $\frac{1}{2}(86-n)$, assuming n as the present age. This formula is very close in results to the official life-expectation tables.

PROBATE, the proof before a proper court that an instrument offered to be proved or registered is the last will and testament of a deceased person. It is the duty of the person or persons named as executors to offer the will for probate, and the instrument should be presented as soon as possible after the death of the testator (the person leaving the will). Separate courts are maintained for this purpose in most states and provinces, and are known as surrogate, or probate, courts. A *citation*, or notice, is issued, when the will is offered for probate, to all the heirs who would have taken the property if no will had been made. On the return of the citation, or the day mentioned, the parties cited may appear and object to the probate of the will on various grounds. A date for hearing is then fixed by the probate judge, and the examination of witnesses proceeds as in any civil action. If statutory requirements have been met, the will is entered, with the sanction of the court, and the executors must give bond, if required, to proceed with the administration of the estate according to the provisions of the will. See WILL; ADMINISTRATOR.

PROBATION. See JUVENILE DELINQUENCY.

PROCAINE, *pro ka' in.* See NOVOCAINE.

PROCEDURE. See COURTS, subhead.

PROCESS BUTTER. See ADULTERATION OF FOODSTUFFS AND CLOTHING.

PROCLAMATION, a notice by an executive of a state, province, or nation, generally in printed form, announcing some order, enactment, or regulation made within the scope of his authority, such as the announcement of a public holiday not otherwise made such by statute, or of general pardon to a group of prisoners or rebels. The latter is called a proclamation of amnesty (which see).

PROCNE. See PHILOMELA.

PROCTER, ADELAIDE ANNE (1825-1864), an English poet, daughter of Bryan Waller Procter, was born in London. Charles Dickens had much to do with making her known to the public, for her earliest poems were sent, under the pen name of MARY BERWICH, to *Household Words*, of which he was editor. Her verses show no great genius, but are marked by tenderness and sincerity of emotion, and are evidently the expressions of a beautiful spirit.

The most popular of her poems is *A Lost Chord*, which Sir Arthur Sullivan set to music. It is a permanent addition to the world's favorite songs, some of its lines most frequently quoted are as follows:

. . I struck one chord of music
Like the sound of a great Amen.

It flooded the crimson twilight,
Like the close of an Angel's Psalm;
And it lay on my fevered spirit
With a touch of infinite calm.

. . .

It may be that Death's bright Angel
Will speak in that chord again;
But it may be that only in Heaven,
I shall hear that grand Amen.

PROCTOR, a name famous in astronomical science, borne by a father and daughter, Richard Anthony Proctor and Mary Proctor.

Richard Anthony Proctor (1837-1888), an English astronomer who did much to increase the general knowledge of astronomy by writing in a popular manner on a great variety of astronomical subjects. He was born in Chelsea, and after his father died, his mother undertook his education at home, on account of his delicate health However, he graduated with honors from Saint John's College, Cambridge, and turned his attention to astronomy and authorship, which proved to be anything but a lucrative profession. The failure of a bank left him dependent on the sale of his works. Although in-

clined to adopt almost any other kind of labor which would ensure him a livelihood, he found that the sale of his books increased when he wrote in a more popular style.

Proctor took pupils in mathematics and held the position of mathematical coach for Woolwich and Sandhurst. In addition, he became a prominent lecturer on astronomy in England, America, and Australia, and a regular contributor to scientific periodicals, in particular to the *Monthly Notices* of the Royal Astronomical Society Of this organization he was elected a member in 1866, becoming honorary secretary in 1872. He was also author of the articles on astronomy in the *American Cyclopaedia* and the *Encyclopaedia Britannica*. His most important contributions to science were his studies regarding the rotation period of Mars and his theory of the solar corona.

Proctor settled in America in 1881, where he remained until his death His memory was honored by the erection of an observatory near San Diego, Calif. Important among his books are *Handbook of the Stars*, *Saturn and His System*, *The Universe of Stars*, *Easy Star Lessons*, and *Old and New Astronomy*.

Mary Proctor was also a well known astronomer She was born in Dublin, Ireland, was graduated at the College of Preceptors, London, in 1898, and later studied at Columbia University, New York City. Miss Proctor specialized in the practical study of solar and meteoric phenomena, and made observations of the total eclipses of the sun at various times and places A popular lecturer on astronomy, she was also a member of several learned societies and a frequent contributor to magazines Her writings include *Stories of Starland*, *The Giant Sun and His Family*, *The Children's Book of the Heavens*, and *Evenings with the Stars*.

PROCURATOR, *prok' u ray tur.* See PILATE, PONTIUS.

PROCYON, *pro' sih on.* See ASTRONOMY (The Stars and Their Names).

PRODUCTION. See ECONOMICS.

PROFILE MOUNTAIN. See NEW HAMPSHIRE (The Land); WHITE MOUNTAINS.

PROFIT, in economics, the return received by the business man as a reward for the effective combination of land, capital, and labor. To illustrate, a business man decides to engage in the manufacture of shoes. He rents a piece of land, and pays rent to the owner. He borrows capital in order to pay for the cost of constructing the plant, installing the machinery, etc., and he pays interest to the lender. He employs laborers to make the shoes, and he pays them wages. If the enterprise proves successful, the manufacturer, from the proceeds of the sale of shoes, will be able to meet the rent, interest, wages, the cost of supplies, and all other expenses of manufacture, and have left a surplus besides. This surplus is called profit. The business man takes what is left after all the expenses of the enterprise have been met. If, by any chance, he employs in the business any of his own funds, he should deduct interest on them before reckoning his profits.

There are two leading theories as to the nature of profits—what they are a reward for. One view is that profits are best regarded as simply a form of wages—a return for the labor and enterprise of the business man. Another view is that profits are essentially a reward for risk undertaken. In this view, the profits of the manufacturer would be reckoned as the surplus of receipts over expenses, including in expenses not only all the items enumerated above, but also "wages of management," this term referring to such remuneration as the manufacturer could have obtained had he been working for some one else. His profits would be only that extra gain that represented a compensation to him for the risk he took that the business might not only fail to return to him any compensation for his own time and trouble, but might even cause him to lose what capital he had himself invested in the business. The risk theory of profit seems to be the most satisfactory one. E.J.

PROFIT AND LOSS. See BOOKKEEPING.

PROFIT SHARING, a system by which employees are given a share in the profits of a firm, in addition to their regular wage. It may take the form of a cash payment, or bonus, made at the end of the year, of shares of stock in the business, or of a savings or an insurance fund from which the workingman is given a pension in his old age, or his family a payment in case of his death.

The first notable experiment in profit sharing was made in 1842, in Paris, by a house painter named Le Claire, who found that the policy had the effect of increasing the remuneration of both employee and employer through the better quality and greater amount of work accomplished. The method has since been widely adopted in England, France, and America, and in most cases it has proved very successful.

The advocates of profit sharing claim that it ensures justice for both capital and labor, each receiving more under the efficiency which the system encourages, and that it lessens industrial unrest by harmonizing the interests of both classes. Some labor leaders profess to see in it, however, only a substitute for real reform. They contend that it hinders the good that should be accomplished through trade unions; that it stimulates the laborers to greater production and then gives them only a portion of the increased production. They object to its likeness to philanthropy, and greatly prefer that a higher wage be regularly paid and the wage-earner be allowed to make his own disposal of the increase. E.J.

PROGRAMS. In THE WORLD BOOK will be found suggested programs for celebration of events of national significance, in connection with such topics as Arbor Day, Christmas, Columbus Day, Dickens' anniversary, Easter,

Flag Day, Hallowe'en, Independence Day, birthday of Robert E. Lee, Lincoln's birthday, Longfellow's birthday, Memorial Day, Thanksgiving Day, Washington's birthday, etc. In these volumes, see articles on the above main titles.

PROGRESO, YUCATAN. See MEXICO, map.

PROGRESSIVE PARTY, the name applied to political organizations at various periods in American history, organized primarily to protest as vigorously as possible against existing political conditions.

The Party of 1912. This was the first so-called Progressive party. It represented the culmination of a liberalizing movement in the Republican party which had been gathering force for two decades. During the Presidential administration of William H. Taft, the more radical Republican leaders became active opponents of his conservative policies, and in the convention of 1912 there was great opposition to his renomination. The strongest candidate of the liberal element was Theodore Roosevelt. In organizing the convention, however, Taft's supporters were able to overcome opposition. The Progressive leaders, charging fraud, retired from the convention and organized a new party, later selecting Theodore Roosevelt as their nominee for President, and Hiram W. Johnson, then governor of California, for Vice-President. The platform urged social, political, and economic reforms.

In the subsequent election, which the Democrats won, the Progressives polled 4,126,020 votes (as compared with 3,483,922 for the Republicans), carrying California, Washington, South Dakota, Minnesota, and Pennsylvania. These states represented a total of eighty-eight electoral votes. However, the various elections held in November, 1914, revealed a weakness in the party, which carried only California and lost in all 2,213,090 votes. The total Progressive vote in that year was 1,916,417, while the Republican vote showed a gain of 2,528,418, indicating that a very large proportion of the Progressives had returned to the parent party.

The 1916 Campaign. The Progressives maintained their organization, and in 1916 held a national convention in Chicago, nominating Roosevelt for President and John W. Parker of Louisiana for Vice-President. No campaign was made, as Roosevelt declined to run. Instead, he gave his support to the Republican candidate, Charles E. Hughes, and most of the Progressive leaders followed his example. The fall election resulted in victory for Woodrow Wilson.

The La Follette "Progressives." In 1924 Senator La Follette of Wisconsin headed a party of protest which bore the name Progressive. Senator Burton K. Wheeler of Montana was selected as Vice-Presidential nominee. The platform, adopted in Cleveland, in July, 1924, advocated the right of Congress to pass upon Supreme Court decisions, called for the revision of the Treaty of Versailles, and opposed monopoly, high tariff, and other conservative policies. La Follette was supported by the Socialist party, but he carried only one state—Wisconsin. His popular vote, however, was 4,822,319.

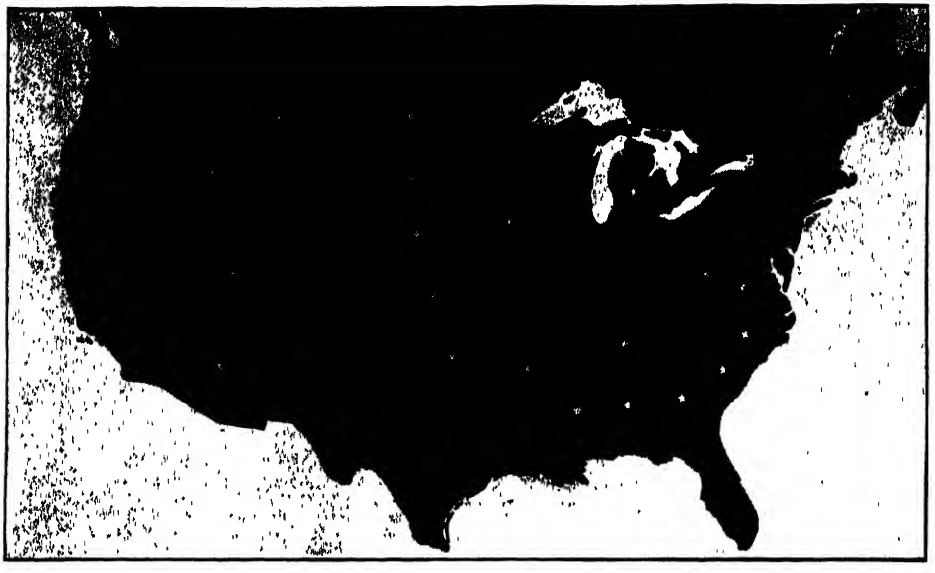
Related Subjects. The reader is referred to the following articles in these volumes

La Follette, Robert M. Political Parties
Roosevelt, Theodore

PROHIBITION, *pro hih bish' un,* the forbidding by law of the sale, and sometimes the manufacture, of alcoholic beverages. The question is one of great public interest, particularly in Canada and the United States, and it is an important factor in the public affairs of both these nations. No attempt is made here to discuss the moral, social, economic, and scientific aspects of the use and restriction of alcoholic beverages. It is the purpose of this article to give the history and status of prohibition in its political or governmental phases.

In the United States. Previous to the War of Secession, Maine and a few other Eastern states passed state-wide prohibition laws, but they were repealed in all of the states except Maine. After the war the liquor business developed rapidly; millions of dollars were invested in breweries and distilleries, and saloons multiplied throughout the country. With the development of the liquor industry came a strong counter-movement for prohibition. In 1872 the Prohibition party held its first national convention. This organization represented an attempt to make the temperance cause a political issue, as both the Republican and the Democratic parties refused to insert prohibition planks in their platforms. Two years later, the Woman's Christian Temperance Union was organized. Both of these organizations, and numerous smaller bodies, aided the anti-liquor movement immeasurably by keeping the issue constantly before the people, but the more practical results were achieved through the efforts of the Anti-Saloon League, organized in Ohio in 1893.

The Country Becomes "Dry." The League worked on the principle that if you cannot cut down the whole tree it is a good plan to lop off some of the branches. Accordingly, where it was not found possible to secure a state prohibition law at the outset, its leaders worked for local option, with the city, township, or county as the prohibition unit. In many instances, states almost voted themselves "dry" by applying in sections the local-option principle. What had been accomplished



STATUS OF PROHIBITION BEFORE THE AMENDMENT

The states shown in solid tint had banished liquor throughout their entire area, or in parts of their area, through local option, before December, 1919 Those shown with stars had statewide prohibition The black areas mark the only sections of the United States where liquor was legally sold before all saloons were closed at midnight on June 30, 1919 The prohibition area before the amendment became effective included over ninety per cent of the area of the country, where lived sixty-eight per cent of the population

is shown in the "wet" and "dry" map of the United States. On July 1, 1919, thirty-one states were in the dry column, or had voted to have state-wide prohibition go into effect on a definite date. It appeared probable that soon all the states, with notable exceptions, would become "dry" territory by local action. As the map shows, there were numerous dry sections in most of the wet states. Alaska (1918), Porto Rico (1917), and the District of Columbia (1917) had also been voted prohibition territory. See map, for additional data.

National action was also taken. The United States Congress passed and the Supreme Court declared constitutional (1916) the Webb-Kenyon law, which stopped the transportation of liquor into prohibition states through interstate commerce. This law put a stop to the practice of shipping liquor from a "wet" to a "dry" state, by which many prohibition laws had been practically nullified. Another Federal legislative act of far-reaching effect was passed in 1917. This act made it unlawful for anyone to send through the United States mails liquor advertisements or solicitation circulars addressed to people in "dry" territory.

A constitutional amendment prohibiting the manufacture and sale of alcoholic beverages throughout the United States had been the goal of the anti-liquor forces for years. The first definite step toward this goal was taken at the close of 1914, when the House of Representatives passed such an amendment by a majority vote, though not by the necessary two-thirds.

With the entrance of the United States into the great war in Europe, a new phase of the question presented itself. Aside from the fact that a nation at war is more efficient when under a prohibition régime, there was the equally important fact that grains needed for food are employed in brewing and distilling. These points were urged by the prohibition leaders in Congress in the summer of 1917, when the food-control bill was being framed. In its final form, this bill carried a section prohibiting the manufacture of distilled liquors; the manufacture of beer and wine the President was given authority to suppress whenever he should deem it necessary. Accordingly, no whisky was manufactured after September 1, 1917; no beer after May 1, 1919. On July 1, 1919, under the war-time act, all intoxicating liquors ceased to be sold, and no saloon in America operated legally after that date, even though the national amendment was not yet in effect. In the autumn of 1917, Congress provided for an amendment to the Constitution of the United States which would make the entire country prohibition territory. Its form is as follows:

SECTION 1. The manufacture, sale, or transportation of intoxicating liquors within, the importation thereof into, or the exportation thereof from the

United States and all territories subject to the jurisdiction thereof, for beverage purposes, is hereby prohibited.

SECTION 2. This article shall be inoperative unless it shall have been ratified as an amendment to the Constitution by the legislatures of the several states, as provided in the Constitution, within six years of the date of the submission thereof to the states by the Congress.

SECTION 3. The Congress shall have the power to enforce this article by appropriate legislation.

The necessary thirty-six states ratified the amendment and gave it validity by January 16, 1919. By proclamation of the Secretary of State of the United States, January 16, 1920, was fixed as the date when national prohibition should be in full effect. The Volstead Act was passed as an enforcement measure, and to define alcoholic drinks. In 1929 this act was supplemented by the Jones Law, imposing heavier penalties.

The enforcement of prohibition devolved upon the Bureau of Internal Revenue in the Treasury Department because that agency had long collected liquor taxes. An Assistant Secretary of the Treasury was named as Prohibition Commissioner, and a special force of Federal prohibition agents and directors was organized. The duties of the department are to detect and suppress violations of the law and to prosecute those charged with its violation. The national budget provides a fund to be used in this work, the amount allowed by the Seventieth Congress being $40,000,000.

Prohibition in the Presidential Election of 1928. In both the Democratic and Republican party platforms, there were declarations favoring the enforcement of the prohibition laws—upholding the Eighteenth Amendment to the Constitution and the enforcing Volstead Act. Before the Democratic convention adjourned, the nominee, Governor Alfred Smith of New York, sent a telegram to its chairman stating that he would make a public appeal for support in an effort to liberalize the prohibition statutes. Although it was evident that neither candidate, after election, would have the power to alter existing conditions, the question was kept in the forefront of the national discussion. In 1930 the President appointed a crime commission; one of its duties was to study prohibition.

In Canada. A local-option measure, known as the Canada Temperance Act, was passed in 1878, prohibiting the sale of intoxicating liquors in places that should adopt it. In the years that followed, a number of counties and municipalities throughout Canada put the law into force, but the greatest advance in prohibition was made after the outbreak of the war in Europe. Saskatchewan "blazed the trail" in 1915, when the provincial government closed every bar in the province and greatly reduced the number of dispensaries. A referendum of the people was taken in December, 1916, and as a result, the remaining dispensaries were voted out of existence by a majority of seven to one. In March, 1916, Manitoba voted for prohibition, to become effective on June 1, and in July of the same year, prohibition went into effect in Alberta. In September a referendum was taken in British Columbia, and prohibition won. Province-wide prohibition was introduced into Ontario in the same year by a legislative enactment. Eventually, every province except Quebec had declared for prohibition.

A reaction against prohibition began, and all of the provinces of the Dominion except Prince Edward Island finally returned to some plan of liquor sale under government control. The laws governing the sale of intoxicating beverages differ in the seven provinces having government control. Four out of the seven require the purchaser to have a permit in order to buy liquor. These permits restrict the amounts that may be purchased within a given time. The distinctive features of the present system are that spirituous liquors are nowhere sold by the glass, the public bar has been abolished, and drinking in restaurants is not permitted, except in Quebec. In the two "dry" provinces, liquor is sold by the government only on medical prescription.

Related Subjects. In connection with this discussion, the reader is referred to the following articles in these volumes:

Anti-Saloon League	Prohibition Party
Good Templars	Temperance
Jones Law	Volstead Act
License	Woman's Christian Temperance Union
Local Option	

PROHIBITION PARTY, a political organization in the United States, formed in 1869, whose object was to secure, through legal enactments, prohibition of the manufacture, sale, and use of intoxicants as a beverage. The Grand Lodge of Good Templars in session at Oswego, N. Y., in May, 1869, appointed a committee to arrange for the calling of a national convention to organize a party pledged to the principles of prohibition. The convention met in Chicago in September of that year and organized the National Prohibition party. The first Presidential campaign in which the party took an active part was that of 1872, and in that contest it polled 5,608 votes. The number of votes increased in subsequent campaigns, until the maximum was reached in 1892, when 271,058 prohibition votes were cast.

While the all-important plank in their platform was that relating to prohibition, the prohibitionists also announced very definite policies on various important questions, such as finance, immigration, woman suffrage, etc.

The addition of other issues to their platform was not always approved by the more ardent members of the party, who would have preferred to go before the people on the single question of prohibition. This disagreement led in the campaign of 1896 to the formation of a second prohibition party, whose platform was limited solely to the one issue.

While the party has never played a prominent part in the political activities of the United States, it exerted a great influence, and the principle it represented finally crystallized in the Eighteenth Amendment to the Constitution of the United States, after four-fifths of the nation's area had become prohibition territory through local option (see map, in article PROHIBITION). Even then, the party retained its identity. In 1920, 1924, and 1928, candidates were offered for election. The 1928 vote was 20,101.

Related Subjects. See list at end of the article PROHIBITION.

PROJECTILE, a word applied to bullets and shells fired from firearms. Projectiles may be roughly divided into two classes—those for use on land and those employed in naval warfare. In naval warfare, the object of the projectile is to penetrate the armor with which a battleship is protected, and sink or disable the vessel. So keen is the race between destruction and defense that no sooner is a shell of great penetrative power invented than armor plate is improved to withstand the assault of that particular shell. However, the advantage has been for the most part on the side of the projectile, and the most powerful battleship afloat is practically at the mercy of an enemy attacking it with guns of longer range.

Related Subjects. The reader will find much material on this subject in the following articles.

Artillery	Fireball	Shell
Bomb	Grenade	Shot
Bullet	Navy	Shrapnel
Cartridge	Poison Gas	Torpedo

PROJECT METHOD IN TEACHING. The phrase used as the title for this article is rapidly coming to occupy a place of great importance in present-day educational writing and discussion. One can hardly read a new book or article on teaching, or listen to an address at a teachers' convention, without encountering it. In an earlier day, the phrases which were used most frequently by educational writers and speakers were "training the mind," "mental discipline," "strengthening the intellect," "culture," and the like. But now one rarely comes across these expressions in educational literature or debate.

What is the essential difference in the point of view denoted by the phrase "project method" and that indicated by such phrases as "mental discipline," "training the mind," and "strengthening the faculties"? The latter relate to school subjects and methods which have little or no direct bearing upon any task which pupils will be required to perform outside of school, or any problem which they will have to solve, or any undertaking in which they will be interested. Education designed to secure "mental discipline" takes but slight account of the practical usefulness of any subject in the mastering of which discipline is to be gained. But slight attention is paid to the attitude of the learner toward any subject; on the contrary, subjects are selected and presented in accordance with the views of adults as to the best way to train such mental faculties as perception, memory, reason, and imagination. People who view education from this standpoint hold that if a pupil uses his mind in *any* way, he can employ the power or ability or strength or keenness thus gained in *every* way he chooses. Psychologists do not now endorse such a view of the mind.

Meaning of Project, Problem, Motivation. Those who are abandoning such phrases as "mental discipline" and are substituting therefor terms like "project," "problem," and "motivation" maintain that pupils should be given an opportunity to acquire the knowledge and gain the skill that they will have need to use in everyday life. According to this view, a pupil cannot do outside of school anything essentially different from what he has done in school (unless he has learned how to do it outside of school). Also, he will accomplish more in the acquisition of knowledge and skill if he is interested in his tasks and feels a motive for performing them, than if he is not interested in them and does not feel any desire to attack them. Again, those who are basing their teaching upon the "project" or "problem" plan hold that when a pupil wishes, for example, to have a sled for coasting, and he actually makes it and thinks through the problem involved in making it, he gains more educational benefit therefrom than he would gain if he simply learned about sleds in a textbook and solved the imaginary problems involved in buying materials therefor. Those who teach according to this method try to have pupils work at *real* tasks which they wish to perform.

While we are moving rapidly toward an educational program denoted by the terms "project," "problem," "motive," and "interest," it is not to be supposed that there is complete harmony among teachers respecting the precise meaning and implications of each of these terms. Many think that "project" and "problem" mean substantially the same, while others make a sharp distinction between them. To the latter persons, "project" refers to definite tasks requiring constructive

motor activity in their performance, such as making a bookcase to contain the books owned or used by the pupil, or by the members of his family or by the school; while "problem" refers to tasks requiring intellectual processes without motor execution. Thus the solving of a theorem in geometry would be a "problem," but could not be a "project."

The distinction between the two is, after all, not vital. They refer to the same fundamental method of teaching, only in the one case pupils deal constructively with material objects, while in the other, they deal with intellectual situations. But in the carrying out of all projects there are problems which must be solved. A pupil performing a task which requires no thinking could hardly be said to be working on a "project" Anything that is purely mechanical and requires nothing from the pupil but persistence and endurance should not be dignified by the term "project," or "problem."

There will be less confusion in thinking about these new terms if one will keep in mind that a normal person is interested in any undertaking which will enable him to accomplish what he sees the people around him accomplishing. The deepest impulse in human nature is for one to try to do what his associates do. The young child who sees his mother making pies is impelled to imitate her. The boy who sees another boy swinging on a trapeze will try to do the same thing up to the standard set by the model, or even better. The embryo teacher who sees an expert arouse interest, enthusiasm, and activity in a class in cookery, for example, will wish to achieve the same measure of success. Nature has implanted this impulse deeply within us, in order that we may develop. If one were not moved from within to master knowledge and skill, he never could be made to do so by any kind of external allurement or coercion. Feebleminded children do not possess in large degree this inner impulse to learn by emulation, and no amount of urging from without can take the place of the inner deficiency.

Project Method Includes Problem, Motivation, Interest. Now, every task which an individual undertakes in order to accomplish what he sees others doing and what he wishes to do is for him a project. In its performance he will encounter problems, and he will be stimulated to solve them by his desire to accomplish the task. He will use his mind and body to the fullness of their capacity, in order to achieve this aim. He is "motivated" at every step, because he has an end to attain which entices him; having a motive, he feels interested in his task. These things all hold together as a unity. They cannot be divorced from one another, except artificially. In a normal mind they do not exist separately, and in teaching, they should not be treated separately. If any person will reflect upon his own daily life, he will see that his "projects," "problems," "motives," and "interests" are all unified. Everyone is constantly seeking to attain ends which he believes will promote his welfare, and in the attainment of these he must solve the problems that arise. His wish to attain the ends operates as motive and as interest to sustain him in his efforts. When one is working on the projects of daily life, he cannot discover that his problems and motives and interests are dissociated processes or entities.

The chief requirement in a teacher is resourcefulness in devising ways and means for pupils to engage in undertakings that seem to them to have real value, and to guide them in solving the problems which arise in performing their tasks. She need not think much about motive or interest, if she can keep her pupils working on projects that appeal to them. The term "project" is herein employed to cover both intellectual and motor tasks. Arithmetical, historical, or literary projects may be just as real and make just as strong an appeal to a pupil as making a kite, or a coop for his chickens, or a desk for the teacher, or any other of dozens of activities.

Projects Must Be Real, Not Imaginary. Some persons seem to be taking a very superficial view of projects. One teacher recently had her pupils tear up paper into fine bits and then "plant" them in rows on the floor, as corn. Then they went through the imaginary movements of hoeing corn and of cutting and husking it. When asked why she required her pupils to spend their time in this way, the teacher replied, "They are developing their imagination." There is a good deal of time wasted in the school in "developing imagination."

Let it be granted that imagination can be developed by such work as has been described. Of what service will it be to any pupil? It will harm him more than it will help him, if he goes far in it, because he will come to substitute imaginary corn for real corn, imaginary hoeing for real hoeing, imaginary husking for real husking. There are individuals who cannot distinguish between real and fantastic activities, and they are hindered rather than helped in dealing with the world. Imagination that is not grounded in real activities is worse than useless.

Major Projects in Elementary Schools. The following projects illustrate and apply the principles presented in the preceding paragraphs. These projects were prepared by Florence C. Fox, specialist in educational systems in the United States Bureau of Education, who has given permission to publish them here.

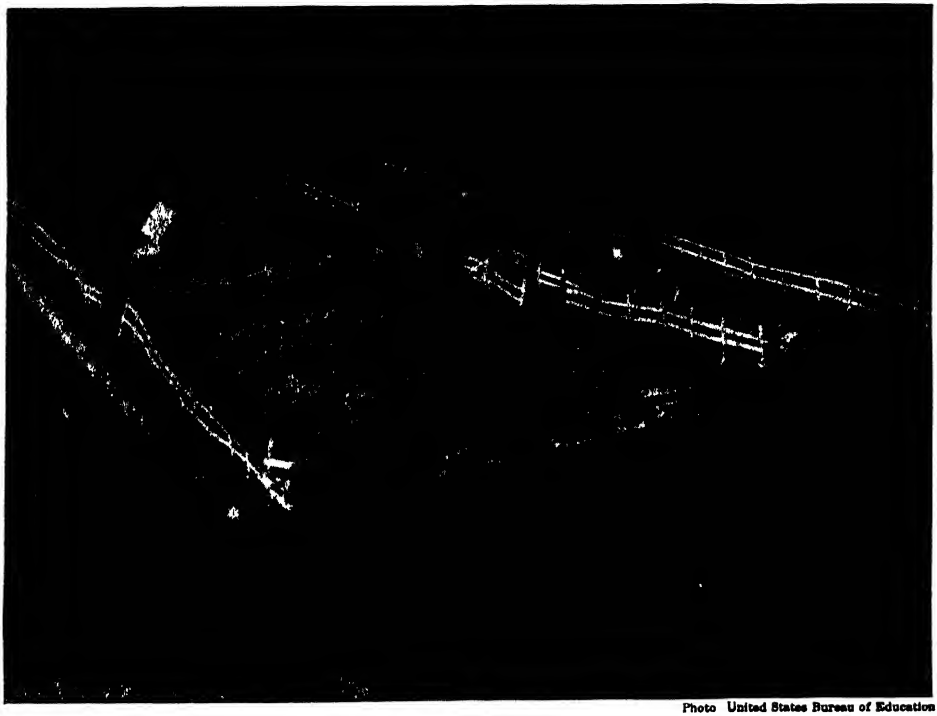


Photo United States Bureau of Education

A FARM ON THE SAND TABLE

I. Building a Farm on the Sand Table

A PLAY PROJECT

The building of a farm on the sand table is a project which has been frequently used in primary and kindergarten schools as a center of interest in the daily program. Such a study is rich in subject matter. From the art side, it offers a wide field of selection. It possesses also a broad historical background and a voluminous literary content, and presents numberless opportunities for the presentation of problems in nature study.

The activities of the farm are varied, and suggest many projects for the primary grades. These farm problems make an especial appeal to the child, because his larger interest in life lies in the matter of feeding. A close connection is easily formed between this interest in his consumption of food and the activities that produce it, and this affords most excellent material for the problem-project type of instruction.

OUTLINES ON THE FARM STUDY

Subjects of study:

1. Agriculture: Wheat; corn; potatoes.
2. Animal life: The horse; cow; sheep; pig; hens and ducks; bees.
3. Shelters: House; barn; henhouse; windmill; pigpens; dovecote.
4. Tools: Plow; drag; scythe; hoe; rake; thrasher; ax; saw.
5. Gates and fences.
6. Vehicles: Carts; wagons.
7. Mills.

Sources of Impression

I. Nature study:
   1. Agriculture· Form, cultivation, and use of wheat, corn, and potatoes
   2. Animal life· Structure, care, and use.
   3 Buildings· Suitable materials
   4 Tools· Raw and manufactured materials
   5 Vehicles. Application of steam and electricity
   6. Mills. Application of steam.

II Art:
   1 Agriculture: The Gleaners, The Sowers; The Harvest Moon; The Angelus.
   2 Animal life· The Horse Fair, The New-born Calf; The Churning; The Shepherdess, The Sheepfold; A Barnyard in Normandy, Feeding the Hens; The Orchard.
   3. Shelters: Mount Vernon; Ann Hathaway's Cottage; The Woodcutter
   4. Tools: The Man with the Hoe; The Song of the Lark; Ploughing; The Haymakers; The End of the Day.
   5. Vehicles: Meeting of the Ways
   6 Mills: Primitive mills.

III History·
   1 Agriculture Cortez introduces wheat into Mexico Pilgrims discover corn Wild potatoes in Virginia
   2 Animal life· The horse in Mexico; sacred cow in India; shepherds and sheep of olden times; the wild boar; the eider duck; the Pilgrim's turkey; wild honey and beeswax.
   3 Buildings: Homes in other lands. Cliff dwellers. Zuñi Indians, Forest Indians, Longhouse Indians, Eskimos, Hottentots, and Pilgrims.

4. Tools: Lincoln's boyhood on a farm; Washington's boyhood on a plantation; primitive tools.
5. Vehicles: Evolution of wheeled vehicles.
6. Mills: Primitive mills.

IV. Stories, songs, poems, and supplementary reading:

1. Agriculture: (*a*) Stories: Ceres; Little Red Hen; Story of Joseph; Redheaded Woodpecker, King Alfred and the Cakes; Black Beauty; Io; Arachne; Circe; Little Hen; King Solomon and the Bees; The Walnut Tree that Wanted to Bear Tulips, Peter, Paul, and Espen; The Chariot Race; Will of the Mill. (*b*) Poems: Ploughman; The Husking; The Potato; The Arab's Farewell to His Horse; The Friendly Cow; Little Bo-peep; The Three Little Pigs; The House in the Sun; To a Honey Bee; I Remember; The Village Blacksmith; Boy Lives on our Farm; The Miller of Dee. (*c*) Songs: Alice's Supper; Swing the Sickle, Busy Farmer; A Gallop; A Trot; Thank You, Pretty Cow; Song of the Shearers; The Pigs; Quack, Quack, Says the Duck; A Jolly Little Rover; The Carpenter; The Blacksmith Over the River; The Mill (*d*) Reading: The Story of Joseph; Mondamin, A Wild Horse; The Dog in the Manger, The First Weaver; The Wild Hog and Sharp Tooth; Little Duck and North Wind; How Bodo Found Wild Honey; The Tree and the Woodcutter; Bodo's Hammer and Knife; Children of the Plains; Children of the Cliffs.

REFERENCES

Art: Perry pictures.

Literature Greek Myths, by Agnes Cook; Fifty Famous Stories, by James Baldwin; Black Beauty, by Anna Sewell; The Chariot Race (Ben Hur), by Lew Wallace, Will of the Mill, by Stevenson.

Poems Lowell, Whittier, Stevenson, Mother Goose, Longfellow.

Songs: Eleanor Smith, Gaynor.

Readers Dopp's Tree Dwellers; Fox's Indian Primer; Aesop's Fables; The Bible.

Modes of Expression

I. Telling:

Reproduction of stories, description of nature observations, and the recounting of historical episodes and narratives.

II Drawing on the blackboard, painting, and cutting colored posters:

Representation of the activities of the farm; the animal life, and the shelters; tools and vehicles on the farm.

III Making and doing:

1. Agriculture: Sow seeds on sand table in appropriate fields, germination; capillarity of soils; pollination; visit a farm, observe plowing, sowing, etc ; visit a mill, observe process of grinding wheat; visit a bakery, observe process of making bread; making bread in school; cooking cereals; canning, preserving, drying fruits; making jelly; making maple sugar.
2. Animal life: Making butter, cheese, and curds; cooking eggs; making soft soap.
3. Buildings: Making house, barn, henhouse, windmill, pigpen, and dovecote out of clay or manila paper; making gates and fences, cart wagon, and sleigh out of wood and manila paper.
4. Tools: Cutting from tin—plow, drag, scythe, hoe, rake, ax, saw; making thrasher out of manila paper.
5. Mills: Making flour mill and wheat elevator out of manila paper.

IV. Modeling.

1. Agriculture: Model wheat, corn, potatoes, before and after germination.
2. Animal life. Model horse, cow, pig, hens and ducks, and place them in fields on the sand table
3. Shelters: Model buildings.
4. Tools: Model tools in clay.
5. Model primitive mills: Cliff dweller's mealing stones, Zuñi turning stones, water mill; windmill.

V. Gesture:

Stories, songs, poems, and reading lessons reproduced in prose and dramatization.

VI. Writing.

Development lessons in reading and language, reproduction of stories, and original accounts of specific lessons given in the subjects of study.

NUMBER VALUES IN THE BUILDING OF A FARM ON THE SAND TABLE

Out of doors:

Material required Tape measure, twine, and pupils.
Statement 1 acre equals 8 rds. by 20 rds.
1 rod measured on the playground.
1 sq rd measured on the playground.
1 acre measured on the playground

In the schoolroom:

Material: Rules, pencils, and checked paper.
Statement: 1 rd. reduced to $\frac{1}{2}$ in.
1 picture rod on paper equals $\frac{1}{2}$ in
1 picture sq rod on paper equals 1 check measuring $\frac{1}{2}$ sq in.
1 picture acre on paper equals 8 checks by 20 checks or 4 in by 10 in
1 sheet of checked paper measures 8 in. by 10 in.
4 picture acres can be drawn on 1 sheet of checked paper

On the sand table:

Material: 24 sheets of check paper with 4 picture acres on each.
Statement 1 rd equals $\frac{1}{2}$ in.
Sand table measures 32 in. by 72 in.
Reduced to rods, equals 64 rd. by 144 rd.
Area of sand table covered with 24 sheets of check paper with 4 acres in each
Margin on two sides left for roads
Counting picture acres on the sand table.
There are 96 acres in our farm
Laying out the sand table in fields—16 acres of corn, 8 acres of millet, 12 acres of meadow, 24 acres of wheat, and 12 acres of oats, 16 acres for farmyard, and 8 acres for orchard.

II. Building a Town on the Sand Table

A PLAY PROJECT

The building of a town on the sand table offers an opportunity for concrete lessons in civic life, through a study of the problems which the child must meet in his everyday experiences The town government, the laws of conduct in public places, and many of the facts concerning drainage, sewerage, and sanitation may be impressed by this mode of teaching. Whole-

some forms of recreation may be suggested, and ways and means indicated by the teacher whereby the children in a town may help to beautify it, to improve its appearance, and to make it a pleasant place in which to live.

The choosing of a profession, a trade, or an occupation by a child who assumes some of the responsibility of the character he represents, even in play, must lead him to appreciate the service which the older members of his community render to the people with whom they live.

1. *Laying out the town on the sand table.* A group of children from the first to the fifth grades were building a miniature town on the sand table. Streets had been laid out and the town platted into blocks and town lots. A central square, in which the courthouse, the church, and the school were to be set, was surrounded on four sides by streets and business blocks, after the plan of many county seats in this country.

2 *Selecting and fencing the lots.* The home lots were chosen in the same way that homesteaders select their farms in the West, by right of first possession In the schoolroom the children swarmed around the table when the signal was given, and located their claims When the fencing operations began, each child, with a small bundle of toothpicks, fenced in his lot by sticking the toothpicks in the wet sand along the line of his boundaries.

3. *Government of the town* The town government was organized by the class and children selected by them to administer it Laws of conduct on the street and in public places were discussed One child, speaking evidently from a full experience, announced, "You don't dare snatch an apple off the fruit stand," and another informed the class with a solemn shake of the head, "If you ride a bicycle on the sidewalk, you get pinched "

4 *Professional life and business life* The professions were represented by children whose fathers enjoyed distinction as physician, lawyer, minister, or professor The little girls chose the womanly occupations, those of milliner, school-teacher, seamstress, and clerks in the postoffice and the dry goods store. The butcher, the grocer, the druggist, and the merchant were all represented by their tiny shops on the main thoroughfare of the town. The millinery shop, made of manila paper, and measuring just 2 inches by 1 inch, sported a gay front window with hats and bonnets painted on in the very latest models.

5. *Drainage and sewerage.* Drainage and sewerage, street lighting, and paving were studied and a fund of experience revealed by children who had stopped along the street on their way to school to look into holes under sidewalks that had been opened for pipe laying and sewer cleaning. Bridges were built across the river that ran through the town, and pavement was laid along the street with blocks of clay.

6. *Amusements.* The last demand that came from this small community was for some form of amusement. The circus appealed to the popular fancy, and an open field at the end of the town was selected where a tent was erected and a circus parade was planned for. So eagerly was the material for this popular pageant contributed that when the circus procession was finally formed it extended twice around the town and out even to the door of the tent.

Stories, songs, and poems. Stories, songs, and poems for the work in literature were selected which had a bearing on the various subjects of study. These were taught to the children and then used as a basis for reproduction in the different modes of expression. "Romulus and Remus, and the Founding of Rome," is a good example of this type of story. Songs of the trades, like "The Carpenter," and the poems like Longfellow's "My Lost Youth," not only have a special significance from the topical standpoint, but are beautiful in themselves and well worth a study by the children

Geography. Even the circus parade disguised itself as a geography lesson when a small boy inquired of the class "Where do all these animals come from, anyway, I'd like to know?" The circus was soon forgotten in the deluge of information concerning animal habitat with which the boy was overwhelmed.

Reading and language lessons. Descriptive sentences, formulated by the class, concerning the fascinating processes of town building were used for the reading and language lessons.

Number lessons A constant demand for measurement in platting the town, in making the buildings, in buying and selling commodities, gave rise to many practical problems of a pertinent character.

Map drawing Out of the demand for information regarding the plan for these lessons, maps were drawn and descriptions written by the children for other grades who desired to work out a similar project.

Modeling and making. Cardboard sloyd played an important part in the building projects. The houses, the shops, and the other public buildings were made of manila paper and cut and pasted to definite measurements, previously determined.

Blackboard drawing, painting and making colored posters Reproductions in blackboard drawing of the town and its special features were used for lessons in chalk modeling Landscapes of towns were painted and posters were made during the art period

Posing and dramatizing Stories were told of the building of towns of peculiar construction and origin and of founders of some of the old historic cities, which led to the dramatization of many of the incidents in the story.

Children's initiative Henry was just five, of the right kindergarten age, yet quite mature enough to bear all the responsibilities of the citizenship which had been assumed by the older members of the school community. When the children were fencing their lots, Henry's deft little fingers had finished the front fence and those on either side of his lot before the other pupils had fairly begun While they were cutting and pasting their tiny pasteboard houses, Henry had finished his and had made, in addition, a smaller one which he called his "garage." When the houses were all finished and placed in their respective owners' lots—Henry had secured a corner lot of superior location on the opening day—something new and strange occurred each day on his little domain Someone noticed a pile of toothpicks behind his garage after the fencing was finished and asked him how he had acquired them.

"Well," he explained, "I picked them up around the town after the others had done fencing their lots, and now if you want any more wood, you'll have to buy it from me."

One morning he surprised us with a new line of fence running back from the road through the middle of his lot.

"You see," he announced, "I had a larger lot than I needed, so I fenced off half of mine to sell "

Side lights were thrown upon the child natures within the class which revealed many personalities as interesting as Henry's proved to be. Adjustment

to his relationships in home and school communities became easier for each child as he understood their significance through the medium of the play home and school community.

Subjects for Project Treatment. Specialists in the State Department of Education of Wisconsin have prepared lists of subjects for project treatment in all the important branches of instruction in the elementary school, and the lists are given below:

IN THE KINDERGARTEN

1. Free project periods, perhaps forty minutes daily, in which pupils may engage in purposeful activities growing out of individual or group interests
2. Making of real toys from substantial materials instead of small paper models
3. Decorating jars and planting bulbs to take to home or hospital.

ENGLISH PROJECTS

1. Publishing a school paper to motivate composition work.
2. Dramatizing selections from literature, making costumes, scenery, and giving the finished play before an audience for some definite purpose.
3. Composing pageants and original plays to illustrate historical events or periods. Making all of the necessary costumes, etc., in keeping with the times represented.
4. Writing original poems, stories, and articles for special school functions.
5. Making four-minute speeches on community topics.
6. Preparing Good American Speech posters and compositions. Preparing Hot Lunch posters and compositions
7. Writing letters to living pupils in different parts of the state or nation, and exchanging compositions dealing with local life and industries.
8. Making of slogans for local "drives."
9. Reading selected books for a Reading Circle diploma.
10. Preparation of own material for silent reading lessons in connection with Hot Lunch Projects, Better Health Program, Good Speech Week, etc.

GEOGRAPHY PROJECTS

1. Making permanent illustrated booklets from material gleaned from many sources and wide reading. Using these as reference work for subsequent classes.
2. Collecting pictures representative of work being done in school. These properly mounted and cataloged form a valuable piece of school equipment
3. Expressing in concrete form with the sand table, or otherwise, industrial and social life facts in this and other countries, as gleaned from reading and observation.
4. Making a museum collection, which may be available for the whole school.
5. Keeping of charts showing weather, bird migrations, flowering seasons of plants, length of day and night, sun's position at time of rising or setting.
6. Gathering of material to show the life histories of insects and small animals, as moths, bees, ants, pollywogs, etc., and making provision for their growth in captivity.

ARITHMETIC PROJECTS

1. Taking charge of the thrift work in the school.
2. Assessing a student tax for a picnic or a like undertaking.
3. Managing a school sale and banking the proceeds.
4. Keeping personal accounts based on a budget system.
5. Finding out local school costs compared with other city expenditures.
6. Working out the local tax rate.
7. Determining required size of a silo to feed the cattle on a given farm in the district.
8. Keeping a milk sheet.
9. Weighing and testing milk to determine percentage of butter fat.
10. Finding the percentage of gain in product when feeding various experimental rations.

CIVICS AND HISTORY PROJECTS

1. Finding from the accounts of historic nations the features of life in earlier centuries that still exist in our life of to-day.
2. Comparisons of problems and conditions at the close of previous wars with those following the recent war.
3. Study of the evolution of the steam engine, auto, and various industries.
4. Impersonation of historic characters and telling of life work before an audience
5. Assembling and organizing the local history.
6. Working up the life history of individuals of local renown.
7. Dramatization of school district, town, and county board meetings and also of the legislature and the President's Cabinet.
8. Giving of speeches and reading of essays at public meetings to arouse local interest in problems of community welfare.
9. Maintaining a school society. M.V.O'S.

PROLATE SPHEROID, *pro' late sfe' roid.* See SPHEROID.

PROLETARIAT, *pro le ta' rih at.* See BOLSHEVIKI.

PROMETHEUS, *pro me' thuse,* commonly, *pro me' the us,* a character in Greek mythology, a son of the Titan Iapetus, and the brother of Epimetheus and Atlas. To Prometheus and Epimetheus was entrusted the task of endowing the animals with the qualities and powers which they needed, and while Epimetheus was engaged in this work, Prometheus occupied himself with creating man from clay. He found, however, when he demanded gifts with which to endow his new creature, that Epimetheus had been so generous to the lower animals that nothing remained for man.

To prevent his being left helpless at the mercy of the lower animals, Prometheus determined to bestow upon man the gift of fire, which would help him to subdue all things, living and inanimate; but fire was possessed by the gods alone, and it was necessary that Prometheus should obtain it without their knowledge. He stole up to Olympus, therefore, and stole back again, bearing in a tube some fire,



THE CHAINED PROMETHEUS
[From a painting by Rubens, in the Oldenburg (Germany) Museum.]

which he entrusted to mankind. Jupiter was so enraged at this theft that he had Prometheus chained to Mount Caucasus, where every day a vulture came and fed upon his liver, which at night grew again. For century after century, Prometheus endured this agony, until Hercules took pity upon him, killed the vulture with an arrow (see SAGITTARIUS), and broke the chains which bound Prometheus. The gods punished mankind by sending among them Pandora.

In Literature. The story of Prometheus has been a favorite with poets of all times. Aeschylus left a *Prometheus Bound*, which was translated by Mrs. Browning, and Shelley wrote a *Prometheus Unbound*.

Related Subjects. The reader is referred in these volumes to the following articles

Jupiter Olympus Pandora

PROMISSORY NOTE. See NOTE.

PRONATORS, *pro na' torz.* See ARM.

PRONGHORN, the so-called American antelope, a noble animal which once roamed the plains and valleys of Western North America from the North Saskatchewan River to Central Mexico. Only a few thousand are left in game preserves in the Western states. The pronghorn is the fleetest of American wild life. It cannot be kept in fenced enclosures, like the buffalo or elk, but needs wide stretches of country where it can roam at will. It must be preserved in the wild state. Unless those who approach its range exercise forbearance, the pronghorn will soon cease to exist. Canada has set aside for it the great Maple Creek Reserve in Saskatchewan.

In 1927 the National Association of Audubon Societies acquired, and set aside for a game reservation, a 380-acre ranch in Northern Nevada; this assures some protection for the pronghorns remaining in Nevada and Oregon. The Association is leading in an effort to secure Congressional action on the preservation of these animals.

The pronghorns are not true antelopes, but form a separate family having some kinship to the American white goat. The name refers to the great black horns of the male, which rise a foot directly above the eyes, and have one prong (sometimes more) on the inner side. These horns are shed annually, like those of the deer, and unlike those of true antelopes. The female has rudimentary horns or is hornless. The body is somewhat like the deer's in shape, is about four and one-half feet long and

three feet high, and is yellowish-brown above and white below, with white markings about the head and on the rump. The hairs on the rump patch are elevated conspicuously by the leader of a herd when it is pointing the way out of danger. The animal has slender legs, a short tail, erect, pointed ears, and large eyes. For illustration of the pronghorn, see the article ANTELOPE. W.N.H.

Scientific Name. The pronghorn is the sole representative of the family *Antilocapridae* Its scientific name is *Antilocapra americana.*

PRONOUN, the part of speech meaning literally *for noun* (Latin *pro* means *for*), which is used in place of a noun to avoid wearisome repetition. For instance, if we were to say, "Mrs. Allen warned Richard not to soil Mrs. Allen's new rug with the mud Richard was bringing in on Richard's shoes," the sentence would be clumsy. The substitution of pronouns, on the other hand, it will be readily seen, gives the sentence ease and fluency, as, "Mrs. Allen warned Richard not to soil *her* new rug with the mud *he* was bringing in on *his* shoes."

In other words, a pronoun is a word that mentions a thing without naming it; and the word to which it refers, whether expressed or understood, is known as its *antecedent.* With this antecedent it agrees in person, number, and gender. Its case depends upon its office in the sentence, and is regulated exactly like the case of the noun.

Classes of Pronouns. Pronouns are so different in types that they are classified for ease in studying. One of the simplest divisions is that into *personal, interrogative, relative, demonstrative,* and *indefinite pronouns,* with the last two classes sometimes grouped, in their adjectival use, as *adjective pronouns,* or *pronominals.*

Personal Pronouns. A word that in itself shows whether it represents the speaker, the person addressed, or the person or thing spoken of, is called a *personal pronoun.* If, like *I, we, myself,* it stands for the speaker, it is termed the *first personal pronoun*; if, like *thou, you, yourself,* it refers to the person spoken to, it is called the *second personal pronoun*; if, like *he, she, it, they, itself, themselves,* it implies the person or thing spoken of, it is known as the *third personal pronoun.*

Declension of Personal Pronouns. There is more formal grammar about the personal pronouns than is left to any other class of English words, for they are fully declined; that is, they have special forms to express all the different relations in which they stand in respect to number, person, gender, and case. The declension of the *simple personal pronouns* is given in the larger table printed herewith (see, also, DECLENSION). The forms *thou, thy, thine, thee,* and *ye,* found in sacred and older English writings, are replaced in modern speech by *you, your,* and *yours,* for both singular and plural.

The *compound personal pronouns,* formed by the addition of *self* or *selves,* have the same form for the nominative and objective cases, but they have no possessive use.

	SINGULAR			PLURAL		
	Nom	*Poss.*	*Obj*	*Nom*	*Poss*	*Obj.*
First person	I	my, mine	me	we	our, ours	us
Second person	thou	thy, thine	thee	ye, you	your, yours	ye, you
Third person	he	his	him	they	their, theirs	them
	she	her, hers	her			
	it	its	it			

Uses of the Compound Personal Pronoun. The compound personal pronoun has properly only two uses: (1) *reflexive,* as in "He did *himself* a great injury," "She saw *herself* reflected in her child"; (2) *emphatic,* as in "I did it *myself,*" "You *yourself* once expressed the same opinion." It is contrary to good usage to substitute the compound form of the pronoun for the simple form, as in "My mother and *myself* will leave for the East to-morrow," or "These cherries were sent for *yourself* and your sister." The sentences should be, "My mother and *I* will leave for the East," and "These cherries were sent for *you* and your sister."

SINGULAR		PLURAL
First person	myself	ourselves
Second person	thyself, yourself	yourselves
Third person	himself, herself, itself	themselves

Interrogative Pronouns. The pronouns *who, which,* and *what,* when used to ask a question, are called *interrogative pronouns.*

Who refers only to human beings or personified objects, and has distinctive forms for the three cases; as, *Who* came? *Whose* writing is this? To *whom* are you telephoning? The case form is the same for both singular and plural.

Which is used to refer to human beings, animals, and inanimate objects, and has the same form for the nominative and the objective, with no possessive use at all: *Which* of those

men is your father? *Which* binding do you prefer?

What refers principally to animals, objects, and abstract ideas, but when used before a noun, it may refer to a person; as in *What* are you looking for? *What* mother would not be just as ready to sacrifice herself for her child? *What* binding do you prefer? In the last example, *what* invites selection from an unlimited field, whereas *which* would imply that a choice must be made among a number of bindings which have been definitely mentioned, or from among a group to which the speaker is referring.

Relative Pronouns. A *relative pronoun* is one that not only "relates" to an antecedent in a preceding clause, but serves as a conjunction connecting its own clause with the clause containing the antecedent. The relative pronouns are *who*, *which*, *that*, and *what*. Their uses are illustrated in the following sentences: That boy *who* is sitting at the desk is my son. He has a volume of history there, *which* seems to be absorbingly interesting. The chapter *that* he is studying is an account of the World War. Let us ask him *what* it says about the Battle of Verdun. *Who* and *which* alone are declinable: nominative, *who*, *which*, possessive, *whose*, objective, *whom*, *which*.

To these four simple relatives there must be added the *relative compounds*, of which *whoever*, *whichever*, and *whatever* are in most common use, with *whoso*, *whosoever*, *whichsoever*, and *whatsoever* gradually becoming more and more archaic Another relative, in constructions where it follows *such*, *same*, or *many*, is the conjunction *as*

Distinctions *Who* is used for persons, the higher animals, and objects personified. *Which* is used for animals and things only. *That*, most general of all, refers to both persons and things. *What* is used only in a neuter sense, and embodies its own antecedent in its meaning of *that which*, or *the thing which*

"Whose" as the Possessive of "Which." The older textbooks strenuously objected to the use of *whose* to express the possessive of *which*, insisting upon *of which* when referring to inanimate things. Modern usage, however, supports the practice in any construction where *of which* sounds awkward or roundabout. For example: "The principles *whose* application we are now studying constitute the framework of the science," rather than "The principles, the application *of which* we are now studying," etc.

Which and That. Earlier grammarians were most particular to draw a sharp line between what they called "restrictive" and "non-restrictive" clauses. Restrictive clauses were introduced by *that*; non-restrictive, by *who* or *which*. For instance, in the sentence, "The bombs, *which* were made in this country, exploded prematurely," the clause *which were made in this country* is non-restrictive, because it simply adds a new thought and implies that *all* the bombs exploded. If the sentence reads, "The bombs *that* were made in this country exploded prematurely," the clause is classed as restrictive, because it limits the meaning and demands the relative *that*—the idea being that only part of the bombs exploded.

This distinction, however, is ignored by many good writers of the present day, and the tendency seems to be to let euphony settle the choice between *that* and *which*. For example, "That electric fan *which* you sold me" is preferred to "That electric fan *that* you sold me," on account of the repetition of *that*.

When the antecedent refers to both persons and things, *that* is always to be preferred, as, "Porters are on hand to look after all travelers and baggage *that* arrive by steamer." It is readily seen that neither *which* nor *who* would be appropriate in such a case.

Demonstrative Pronouns. Pronouns which point out some particular person or thing, answering the question *which*, are called *demonstrative pronouns*. This class includes *this* and its plural *these*, which indicate persons and objects close at hand, *that* and its plural *those*, indicating persons and objects that are more distant.

When these words are used alone, as substantives, they are common pronouns: *This* is my fountain pen, *These* look fresher than *those*. When used to modify a noun, they assume the nature of an adjective, and for this reason are often classed as *adjective pronouns* or *pronominals*· *This* fountain pen writes smoothly, *These* peaches look fresher than *those* apricots.

Indefinite Pronouns. The name of *indefinite pronouns* is given to another class of words which have the same double use as the demonstratives, but do not refer to a definite person or thing In this group are included *one*, *each*, *other*, *any*, *some*, *either*, *neither*, *both*, *many*, *sundry*, *several*, and *certain*, together with their compounds, such as *anyone*, *anybody*, *each one*, *some one*, *somebody*, *no one*, *every one*, *either one*, *anybody else*, *nobody else*, and the like. To the same group belong also *aught*, *naught*, and *none*, although these last-named indefinite pronouns cannot be employed as adjectives. The pronoun *it*, in such constructions as *"It* is storming," is likewise considered an indefinite pronoun. Forms like *each other*, *one another*, *every other* are termed *pronoun phrases*.

Either, *Neither*, *Each*. *Either* and *neither*, when employed as pronouns or pronoun adjectives, should never be used in connection with more than two persons or things. It is important to remember that *each*, *every*, *either*, and *neither* are singular in meaning, and that

when they stand as antecedents, they must be followed by singular pronouns; as, "*Each* member is requested to place *his* contribution in the envelope provided"—not, in the language of the careless speaker, *their contributions*.

Note also that it is correct to say, "Each boy and girl should bring *his* contribution to-morrow," rather than the cumbersome *his or her*, since in the absence of a special personal pronoun of common gender, usage has adopted the pronoun *he*

Common Errors. The pronoun suffers much misuse at the hands of ignorant or careless speakers and writers. Various common errors are covered in the following examples. See, also, errors listed under CASE, NOUN, PARTICIPLE.

Margaret, too, was naturally curious, but it never tormented her as it did her sister, for *Margaret, too, was naturally curious, but her curiosity never tormented her as it did her sister* We must not leave the antecedent to be inferred by the reader from the adjective *curious*

The errors of which the two following sentences are examples may more easily be avoided if one remembers that the case of a relative pronoun in a clause does not depend upon its antecedent, but upon the position of the pronoun in the dependent clause of which it is a part

(a) *He is a faithful employee, whom I know will prove a valuable worker*, for *He is a faithful employee, who I know will prove a valuable worker* *Who* is not the object of the verb *know*, but the subject of *will prove*, and therefore in the nominative case *I know* is really parenthetical, by omitting it, the true sentence structure is readily recognized This is a very common error

(b) *Whom did you say was at the party?* for *Who did you say was at the party?* Another error similar to the foregoing The sentence is, *Who was at the party? Did you say*, being merely parenthetical, does not affect the case of the pronoun

I do not like those kind of people, for *I do not like that kind of person* *Kind*, being a singular noun, demands a singular pronoun and a singular verb. However, when the reference is to several varieties, *these* may very properly be used with *sorts* or *kinds*; as, *I do not care for these kinds of fruit*

Did you notice them girls on horseback? for *Did you notice those girls on horseback? Them* is not one of the adjective pronouns, therefore we cannot use it to modify *girls*

At either end of the path grew a giant lilac bush, for *At each end of the path grew a giant lilac bush. Either* means one or the other. *Each* refers to both, considered singly

Donations may be sent in care of either of these five newspapers, for *Donations may be sent in care of any one of these five newspapers* *Either* refers properly to no more than two

One is apt to lose their head when an accident occurs, for *One is apt to lose one's head when an accident occurs. One*, being a singular pronoun, cannot be followed by the plural possessive *their. One's*, it should be noted, is preferable to *his*

He handles a racket better than her, for *He handles a racket better than she* Expand the sentence to read, "He handles a racket better than *she does*," and the necessity of the nominative pronoun becomes apparent.

It was her we wanted, for *It was she we wanted.* The verb *to be* requires the same case after it as before it; hence the nominative *she*. The true object of *wanted* is the relative pronoun *whom*, understood.

Don't be afraid, it is only me, for *Don't be afraid; it is only I* Here again the verb *to be* calls for the nominative. We have heard students confess that they hesitated to say "It is I" or to answer "I" to the question, "Who is it?" because of a feeling that it savors of affectation This is sheer absurdity.

Her and me are neighbors, for *She and I are neighbors* This is a frequent error among children and illiterate people The objective form of the pronoun cannot stand as the subject of the sentence

Between you and I, he invited only we two, for *Between you and me, he invited only us two* If we transpose the two objects of *between*, saying *between I and you*, and omit the numeral after the pronoun, to make the sentence read *he invited we*, the mistakes take on added clearness

That canary of her's is molting it's feathers, for *That canary of hers is molting its feathers* One frequently sees this misuse of the apostrophe The forms *hers* and *its* are already possessive

Outline on Pronoun

I Definition and Derivation
II. Classes
  (a) Personal
    1 Simple
    2 Compound
  (b) Interrogative
  (c) Relative
  (d) Demonstrative
  (e) Indefinite
III Common Errors

PRONUNCIATION, OF FOREIGN NAMES. The French and Germans, in speaking proper names of other nationalities than their own, usually give to such names the pronunciation they would have in French or German. The English custom, however, differs from this, and requires that a foreign proper name shall be pronounced as nearly as possible as it would be in the language to which it belongs. In the United States, it is becoming a common practice to speak all foreign words with ordinary English pronunciation; this custom is endorsed by leading scholars. Thus Americans feel it quite proper to say *Don Quicksote*, instead of *Don Kehotay*, for *Don Quixote*.

Almost all of the European alphabets were derived from the Roman, but many of the letters have acquired such different values in the various languages that it is almost impossible for a person acquainted only with English to tell anything about the pronunciation of foreign names, unless he has specific information as to the different letter sounds. It would be impossible, for instance, for an Englishman or American to guess that the Spanish words *La Jolla* sound more like *La Hoya* than any other English equivalent.

This article aims to give information which it is hoped will be sufficient to assist one in pronouncing names in any of the European languages. There are few general rules which can be stated. It may be said, however, that, in most languages except English, each vowel is sounded, except in cases of double vowels, when the two usually make one syllable, as in Dutch *Baas*, pronounced *bahs*. It is possible, therefore, to tell at a glance how many syllables a foreign word has—as many as there are vowels.

Accent. In almost every speech, one syllable of each word is stressed more than the others, but in no other language is this accent as strong as in English. Unaccented syllables are in general given more nearly their full value, and the accented syllable is not dwelt upon emphatically. To foreigners, the English seem to drawl, because they exaggerate the length of the vowel in an accented syllable.

In *French* the accent is particularly weak, some linguists declaring that there is no accent at all; but the slight stress falls uniformly on the last syllable. The *German* system of accenting closely resembles the English, and one who is familiar with the latter language can almost invariably place the accent correctly in German words. In *Italian* the accent usually falls on the next to the last syllable, while in *Spanish* and *Portuguese* it falls on the last syllable, unless that syllable ends with a vowel, or, in Spanish, with *n* or *s*. In such cases, the next to the last syllable is accented. In *Hungarian* the accent is always on the first syllable, while in *Welsh* and *Polish*, it is usually on the next to the last. The accent of a *Greek* word is determined by the accent mark of the written word, and *Turkish* resembles the *French* in placing a light accent on the last syllable. *Russian* admits of no general rules, each case requiring special knowledge.

Phonetic Value of Letters. The following list, while not exhaustive, gives the chief values of the vowels and consonants in the modern languages of Europe. If nothing is indicated as to the sound of a letter, it is pronounced as in English.

A has in most languages one of the more open sounds, as in English *father*, *grass*, or even *hat*. In Hungarian *a* without a diacritical mark most closely resembles *o* in *not*, while *á* is like *a* in *far* Certain East Indian languages have a short *a* like *u* in *shut*.

Ã in French is like *a* without an accent mark, and resembles *a* in *car*; in Rumanian it is like *i* in *pin*.

Ă is but another way of writing *ae*. See below.

Â in Rumanian is like *e* in *fern*.

Å in Swedish is closest to English *a* in *hall*, though sometimes it resembles *o* in *obey*.

AA in Danish and Norwegian is like the Swedish *å*; in Dutch it is like *ae*. See below.

AE in German (frequently written *ä*) is sometimes like *a* in *rate*, sometimes like *e* in *met*; in Dutch, like *a* in *father*; in Swedish, like *e* in *met*; in Danish and Norwegian, like *a* in *cat*; in Welsh, most nearly like *i* in *price*.

ÃE in Portuguese is like *i* in *price*, but is given a nasal twang.

AI in most languages is pronounced like *aye* "yes," although usually shortened to the sound of *i* in *price*. In French it resembles *a* in *fate*, and in modern Greek, *e* in *met*, while the Hungarian equivalent *aj*, where *j* is a vowel, is like *oy* in *boy*.

AM, AN in French and in Portuguese, if they are final or are followed by a consonant other than *m* or *n*, have the sound of *a* in *father*, spoken through the nose. The Portuguese *a* has the same value. English has no sound equivalent to this, and in books which make use of a phonetic system of pronunciation, as do these volumes, the nasalized *n* is usually indicated by an italic capital, as *N*.

ÃO in Portuguese is like English *ou* in *mouse*, but nasalized.

AU is in most languages like *ou* in *mouse*—the German *Haus* and English *house* are identical in sound and meaning In French, however, this diphthong has the sound of *o* in *note*.

ÄU in German, like *oi* in *foil*.

AW in Welsh, like *ou* in *mouse*.

AY is generally treated like *ai*. In French and Spanish, when succeeded by a vowel, the *y* is given its consonant value, and the *a* pronounced as though it stood alone

B in German, Dutch, and the Slavic languages is pronounced like *p* if it is final or followed by a consonant In Spanish, *b* more closely resembles the English *v*, though the lips alone and not the teeth are employed in its pronunciation

C, before *e*, *i*, or *y*, the vowels which follow the "soft" sound of *c* in English, is pronounced in German like *ts*; in French and Portuguese, like *s*; in Spanish, sometimes like *th* in *thought*, sometimes like *s* in *sit*. In Welsh and Gaelic, it always has the *k* sound, and in the Slavic languages, it is always like *ts*.

Ç is like *s* in *sun*.

Č in Bohemian, Serbian, and Bulgarian and *c* in Polish are like *ch* in *chair*.

CC in Italian is a compound sound like *t-ch* in *chit-chat*.

CH in Spanish is like *ch* in *chair*; in Italian, like *k*; in French and Portuguese, like *sh* in *shall*. In German, *ch* has a guttural sound which has no equivalent in English, though the Scotch has it in *loch*. It is made between the back of the tongue and the soft palate. See G below.

CS in Hungarian is like *ch* in *chair*.

CU in Spanish is like *qu* in *quit* if it is followed by a vowel and has no accent, as *cu* or *cú*

CZ in Hungarian is like *ts*; in Polish, like *ch* in *chair*.

D in German, Dutch, and the Slavic languages has the same relation to *t* that *b* has to *p*—is pronounced like it when final or when preceding a consonant in the same syllable. In Spanish, Danish, and modern Greek, it is almost like *th* in *this* when it occurs at the end of a word or between two vowels; and in Danish and Norwegian, it is silent after *l* or *n* in the same syllable.

DD in Welsh is like *th* in *this*.

DT is like *t*.

DZ is like *j*.

E has various sounds in the European languages, but in none except modern Greek does it have the English "long *e*" sound, as in *he*. It may be like *a* in *mate*, or like *e* in *met* or in *where*. In French,

final *e* is silent unless it has an accent, and is much slighted when it ends any syllable.

Ê in French is like *a* in *mate*.

Ë and Ê in French are like *e* in *where* or like *a* in *rebate*.

EAU in French is like *o* in *note*.

EI in French is like *a* in *rebate*; in German, Dutch, and Welsh, like *i* in *pine*; and in other languages, like *a* in *ray*.

EIN in French is equivalent to *in* (see below).

EN in French is like *an* (see above)

EU in French and Dutch is much like *e* in *her*. It has, however, no real equivalent in English, but is like the German *ö*. In German, *eu* is like *oi* in *toil*.

G before *a*, *o*, or *u* is like *g* in *get* in all the European languages; in German it has the same sound when used at the beginning of a word, or before a vowel or a liquid in the same syllable In French, Spanish, Portuguese, Swedish, and Rumanian, *g* has before *e*, *i*, or *y* the sound of *j* in the same language (see *j* below), while in modern Greek it is like *y* in *yet*. In German and Dutch, it has in certain positions a guttural sound, like that of the German *ch*.

GH in Italian and Rumanian is like *g* in *get*; in Irish it is more like *h*.

GLI in Italian when followed by a vowel is like *lli* in *William*; when final, or followed by a consonant, the *i* is pronounced like *e* in *be*.

GN in French and Italian is like *ñ* in Spanish or *nh* in Portuguese—like the English *ni* in *mnion*.

GU in French is like *g* in *game* before *e*, *i*, or *y*, unless a consonant or an *e* follows, in which case the *u* has its regular sound. In Italian, *gu* is always like *gw* in *Gwen*.

H in French, Spanish, Portuguese, and Italian is silent except in such combinations as *ch*, *gh*, and the like. In German it is silent between two vowels in the same word, except where preceding *ei*, and in Swedish it is silent before *j*.

I in most European languages has the sound given it in *machine*, or the shortened sound in *it*. In a few Danish names, it is like *e* in *met*.

IE usually has the sound given it in English in *yield*.

IEN in French is like *in* preceded by a *y* sound.

IJ in Dutch resembles *i* in *price*.

IL final and ILL in the middle of a word in French have the sound of *y* in *yes* when they follow a vowel which is pronounced; otherwise, they have the sound of *i* in *machine*, followed by the sound of *y*.

IM and IN in French are like *a* in *hat*, but pronounced through the nose.

J in German, Italian, Dutch, the Scandinavian languages, Polish, and Hungarian has the sound of *y* in *yellow*; in French and Portuguese, the sound of *s* in *pleasure*, and in Spanish, the sound of *h*, very distinctly pronounced.

K is in most languages pronounced as in English; in Swedish, however, before *e*, *i*, *y*, *ä*, or *ö*, it closely resembles *ch* in *chair*.

LL in Spanish is like the sound of *lli* in *million*, though in names of places in the colonies, or in North America, the *l* sound is usually not heard. Thus *La Jolla* is *La Hoya*, as noted above, and not *La Holya*.

M and N are like the English *m* and *n*, except where they serve merely to give a nasalized character to vowels (see AM, EN, IN, UM).

Ñ in Spanish and NH in Portuguese are like *ni* in *minion*.

NG in German is always like *ng* in *wringer*.

O is most frequently like *o* in *no*, *obey*, *core*, though sometimes like *o* in *rot*. In Swedish a final *o* or one which constitutes a syllable is like *oo* in *school* or like *u* in *pull*.

Ö has no exact English equivalent, but is almost nearly like *e* in *fern*.

Ô in French is like *o* in *note*.

Õ in Portuguese is like *o* in *note*, pronounced through the nose.

OE is sometimes a substitute for *ö*; in Dutch, however, it is pronounced like *u* in *rule* or *pull*; in Welsh, like *oi* in *toil*.

ŌE in Portuguese is like *oi* in *toil*, spoken through the nose.

OEU in French is like *eu* (see above).

OI is in general much like *oi* in *oil*; in French, however, it is like *wa* in *wasp*.

OIN in French is like *in* (see above) preceded by the sound of *w*.

OO is like *o* in *note*.

OU in French is like *u* in *rule*, *pull*; in Portuguese, like *o* in *note*; in Dutch and Norwegian, like *ou* in *house*.

QU in French, and before *e* or *i* in Spanish and Portuguese, is like *k*; in German, like *kv*; and elsewhere, like the English *k* in *quick*.

R has in most European languages more of a trilled sound than in English. Certain French and German words require a guttural sound of *r* which cannot be indicated in English.

Ř in Bohemian is like *r* followed by the sound of *s* in *pleasure*.

S, in German, if before a vowel and not following a liquid or a surd (*p*, *f*, *s*, *t*, or *k*), and in French between two vowels, is pronounced like *z* in *zither*. In Hungarian, and in German where it precedes *t* or *p*, it has the sound of *sh* in *shall*; and in Portuguese it resembles *sh* if final or preceding *p*, *f*, *t*, or *k*, and *zh* (*s* in *pleasure*) before *d*, *b*, *v*, or *g* In Spanish, Dutch, and Swedish, *s* is always pronounced as in *sun*, while in Italian it has sometimes this sound, sometimes that of *z*.

Š in Bohemian, Bulgarian, and Serbian is like *sh* in *shall*.

SC in Italian before *e* or *i* is like *sh* in *shall*.

SCH in German is like *sh* in *shall*; in Italian and Rumanian, it is like *sk* before *e* or *i*; in Dutch, like *sg* (see below) before vowels, and like *s* before consonants.

SG in Dutch most nearly resembles English *sk*, though the *g* has a distinctly guttural sound.

SJ in Danish, Swedish, and Dutch is like *sh* in *shall*.

SK in Swedish and Norwegian is like *sh* in *shall* before *e*, *i*, and *y*. SKJ has the *sh* sound always in these two languages.

SS is usually like *s* in *sun*, but in Hungarian like *sh* in *shall*.

STJ in Swedish closely resembles *sh* in *shall*.

SZ in Hungarian is like *s* in *sun*; in Polish, like *sh* in *shall*.

TH is generally like English *t*, but in Welsh and modern Greek, is like *th* in *thought*.

TSCH in German is like *ch* in *chair*.

TY in Hungarian is like *t* followed by a *y* sound, closely resembling the *tu* sound in *future*.

U has generally the *oo* sound, as in *rude*, or the sound of *u*, as in *pull*. The French *u* differs from any sound heard in English, but is like the German *ü*. If the lips are put in position for pronouncing

oo, and *e* as in *be* is sounded instead, the result will be much like the French *u*. *U* in Welsh is like *i* in *pique*.

U, see U above.

UI in French is much like English *we*, except when preceded by *g* or *q*; in Dutch it resembles *oi* in *oil*.

UM, UN in French have much the sound of *e* in *fern*, pronounced through the nose.

UU in Dutch has a prolonged sound of *u*

UY in French is like *ui*, except when a following vowel gives it an additional *y* sound

V in Dutch, Polish, and Russian is like *f* when it occurs at the end of a word or of one member of a compound word; otherwise, it is like English *v*

W in German, Polish, Swedish, and Norwegian is like English *v*, in Dutch it more closely resembles the English *w*, though the lips are not rounded in pronouncing it In Welsh it is a vowel and has the sound of *oo* in *boot*.

X in Spanish is sometimes pronounced like *j*, *g*, or *s*; in Portuguese it is like *sh* in *shall*

Y is generally like *i* in *psque*. In Danish, Norwegian, and Swedish, it is like the French *u*

Z in German and Italian is like *ts* in *cats*; in Danish, Norwegian, and Swedish, like *s* in *sun*, in Spanish like *th* in *thought*, though the colonies and some localities in Spain sound it as *s* in *sun*. In Portuguese it is like *sh* when final, and in other languages, like *z* in *zither*.

Ž in Bohemian, Bulgarian, and Serbian is like *z* in *azure*, and *zs* in Hungarian has the same sound

PROPELLER, OR SCREW PROPELLER, a mechanical device used to drive aircraft, ships, and boats, and for a variety of other purposes. The airplane and marine propellers are the best-known types, but other forms are employed in the windmill, the electric fan, and other kinds of blowers.

Marine Propeller. The use of a screw propeller for ships is very old, having originated with John Fitch (which see) in 1796 His screw was in the form of a spiral around a cylindrical rod. By experimentation it was found that better results were obtained by using only portions of the spiral in the form of blades. The shape of the blades, as well as their diameter and slant (pitch), was determined both by theory and by experiment, and these matters are still subjects of investigation. In general, the present day blade is elliptical in outline, and the number of blades is usually three, though two and four blade propellers are also used.

A certain loss of motion, called slip, is experienced with both marine and air propellers. It is the difference between the vessel's actual speed and the speed which it would have if the propeller were acting upon a solid.

The factors that determine the speed of a given ship are engine speed and horse power, and the pitch and diameter of the propeller. It is the purpose of good design to keep the slip as low as possible. Even under the best conditions, it will amount to from twenty to thirty per cent.

Marine propellers range in diameter from ten inches, for very small boats, to ninety-six inches, for large motorships. The principal material of which they are made is bronze, and the United States government has established standards of tensile strength and elasticity for testing this material.

Modern propellers are efficient in operation, and have greatly increased the speed and power of all forms of water craft. They are almost universally used for ship propulsion.

Airplane Propeller. This is known as an airscrew. Its function is to change the power of the engine into a thrust which will give velocity to the plane or airship. It consists of two or more blades, each of which is shaped, in section, like an airplane wing. In effect, the action of the propeller is like spinning a small wing about one of its ends. The same laws that govern the operation of the wings apply also to the action of the airscrew.

Airplane propellers are made of wood, metal, or a composition with bakelite as the chief constituent (see BAKELITE) Each material has its advantages, but metal forms are coming more and more into use; duralumin is the preferred metal for this purpose. Because of the very high speed of the blade tips, it is necessary that the material used should be able to withstand extremely high stresses Propeller speed usually varies between 1,600 and 1,800 revolutions per minute.

Propellers with adjustable blades have been used experimentally, their purpose being to obtain the maximum power of the engine under all conditions by changing the pitch of the blades. It appears, however, that the advantages over the fixed-blade type for ordinary use are decidedly limited

The Autogyro. This is an airplane in which the ordinary wings and propeller are replaced by four large blades which rotate horizontally above the body of the plane. The blades are not driven by an engine, but by the action of the wind, just as in the case of the windmill The blades are hinged, so that they rise and fall in the course of one revolution. The new problems in airscrew theory presented in the autogyro make this invention a subject of interest to engineers, and it is being carefully studied for the new light which it may throw on the science of aviation [see AIRCRAFT (Autogyro)].

The Windmill. The function of the airscrew used in the windmill is the opposite of that of the ordinary propeller. Instead of converting power into a moving thrust, the windmill receives power from a windstream and changes it into a rotating effect. The theories and laws of the airscrew, however, apply to the windmill as well as to the propeller. The windmill may be thought of as the reverse of the ordinary propeller.

The Electric Fan. In this device an airscrew is used to impart motion to the air, just as in the case of the airplane propeller. But the purpose of the fan is to move the air rather than the object to which it is attached. Therefore it is merely a different application of well-defined airscrew principles.

[For illustrations of some of the propellers mentioned, see the articles AIRCRAFT; MOTOR BOAT; SHIP; WINDMILL.]

PROPHET, *prof' et,* one who represents God before men. The true prophet, as pictured in the Old Testament, was a man of vision, who received a message from God; and a man of speech, who delivered that message to the people. There are two distinct periods of Old Testament prophecy. In the first, extending from Samuel to Elisha, the prophet was known as a *seer,* and was commonly consulted as to the course of future events (*I Samuel* IX, 6) At first, the prophets were the friends and advisers of the kings, but as idolatry began to be introduced by the later kings, they became their active opponents, as shown by Elijah's opposition to Ahab (*I Kings* XVIII).

In the second period of prophecy, extending from Amos to Malachi, the prophet was a preacher of righteousness who addressed the people on public questions and tried to mold society according to the standards of religion and morality. In this period, prophecies began to be written, and the last seventeen books of the Old Testament, excepting *Lamentations,* are prophecies of this period.

PROPHETS, The See JESUS, subhead.

PROPHYLAXIS, *pro fih lak' sis.* See DENTISTRY (Preventive Dentistry)

PROPOLIS, *prop' o lis,* a name for bee gum. See BEE.

PROPONTIS, the ancient name of the Sea of Marmora. See MARMORA.

PROPORTION, in mathematics, an equality of ratios. *Ratio* is the relation of one quantity to another and is found by division (see RATIO). The ratio of one quantity to another of the same kind is defined as the number by which the second must be multiplied to produce the first. It may be expressed as a common fraction, as $\frac{2}{6}$ or $\frac{a}{b}$; or in the form of 2 : 6; a.b. The quantities compared are called the *terms* of the ratio. The first term is the *antecedent,* and the second the *consequent.* In the ratio $a : b$, a is the antecedent and b the consequent. If both terms of the ratio are multiplied or divided by the same number, the value of the ratio is not changed. The ratio 2 : 4 is the same as 4 : 8; also, $\frac{5}{15}=\frac{15}{45}$.

A *proportion* is an expression of equality of ratios, as $2:4=3:6$; $a:b=c:d$. These expressions are read: 2 is to 4 as 3 is to 6; a is to b as c is to d. Proportions may also be expressed in common fractions, as $\frac{4}{2}=\frac{6}{3}$; $\frac{a}{b}=\frac{c}{d}$. The quantities compared in the two ratios constitute the *terms* of the proportion. The first and last terms are the *extremes,* the second and third the *means.* The general law of a proportion is: *The product of the extremes equals the product of the means.* In the proportion $2 \cdot 4=3 : 6$, $2\times6=4\times3$.

Any extreme of a proportion may be found by dividing the product of the means by the given extreme, as $n : 4=3 : 6$; $\frac{3\times4}{6}=2$, the required extreme. Any mean of a proportion may be found by dividing the product of the extremes by the given mean, as $3 : 9=n : 12$; $\frac{3\times12}{9}=4$, the required mean.

In arithmetic, proportion is sometimes referred to as *the rule of three,* because three quantities are given to find the fourth. J W.Y.

PROPRAETOR, *pro pre' tor,* in ancient Rome, governor of a province. See CAESAR, CAIUS JULIUS.

PROPYLAEA, *prop ih le' ah.* See ATHENS (The Ancient City).

PROSCENIUM. See THEATER.

PROSE, *proze.* In the article LITERATURE, in these volumes, there is a reference to the man of middle age, a character in one of Molière's comedies, who is suddenly amazed to find that all his life he has been talking prose. It may be repeated here, because it is an important fact, that though prose existed long before poetry as spoken language, as literature it is of later origin. In the early days of a nation, long before the invention of printing, or before writing became common, poems might easily be memorized and handed down by word of mouth, whereas a prose composition would not lend itself to such forms of transmission. Prose had begun to fill an important place in the intellectual life of the world long before the invention of the printing press in the fifteenth century, but beginning with that date, its importance increased very rapidly. Not everything that was published, however, was literature, any more than all the prose which to-day issues from the presses is literature. A really artistic prose literature, in fact, was a late development in the history of every nation, and great prose writers are no more numerous than are great poets.

The commonly accepted classification of prose divides it into *narration, description, exposition,* and *argumentation,* but few writings fall wholly within any one of these classes. Stories, though mainly narrative in character, often include much description and more or less exposition, while an oration, primarily ar-

gumentative, must usually contain a large proportion of exposition.

The distinguishing characteristic of poetry is its metrical form. It is worthy of note, however, that some prose is so musical that we call it poetical prose, and poetry may be so lacking in rhythm that we call it prosaic. In this connection, see AMERICAN LITERATURE (The More Recent Poets).

Related Subjects. The reader is referred in these volumes to the following articles:

Essay	Fiction	Novel
Fable	Literature	Oration

PROSE EDDA. See EDDA; SNORRI STURLUSON.

PROSERPINA, *pro sur' pih nah,* OR **PERSEPHONE,** *pur sef' o ne,* in classical mythology, the beautiful daughter of Ceres, goddess of agriculture. Herself the special protector of flowers, Proserpina spent much time in the meadows attending to her favorites. One day while she was engaged in this pleasant task, the god Pluto came by in his chariot, drawn by his coal-black horses. Seeing Proserpina, with whom he had long been in love, thus unprotected, Pluto seized her and bore her off in his chariot down to his underground home. In vain she begged for release, and at length gave up hope of returning to the upper world and the light of the sun.

Meanwhile, Ceres had sought everywhere for her beloved daughter, and when she at last discovered her whereabouts, she obtained from Jupiter and the Fates a promise that Proserpina might return if no food had passed her lips while she was in Pluto's realm. When Mercury went to bring her back to earth, however, he found that she had eaten six pomegranate seeds, and in consequence, she was obliged to spend half of her time each year with her gloomy husband underground. During each six months that she was permitted to be above ground, vegetation flourished, but during the rest of the year winter reigned. This is one of the old myths which account for the change in seasons and it is the most popular one in mythological lore.

Related Subjects. See CERES; PLUTO, PSYCHE; and for a detailed story of Proserpina, MYTHOLOGY (The Underground Queen).

PROSTHETICS, *pros thet' iks.* See DENTISTRY, subhead.

PROTECTION, *pro tek' shun,* in economics and government, is the policy of giving assistance to home industries, either by placing a high tariff on foreign production, or by granting a bounty on domestic production. The payment of bounties is direct and convincing assistance, but it requires a costly and complex administrative machinery. The easiest way of securing protection is through high customs duties on imported articles.

The Theory of Protection. In theory, a protective tariff is intended to equalize the difference in cost of production of an article in two countries which are trade competitors. In Holland, for example, where wages are low, an article may be made and shipped to America at a cost of fifteen cents; under the higher wage system existing in America, the cost of manufacture, not including shipping charges, may be twenty cents. If competition be based upon existing conditions, the American factory-owner will have to cease the manufacture of the article which can be produced more cheaply abroad. However, by the imposition of a tariff upon the product of the Dutch factory, that article, laid down in America, costs a sum more nearly equal to the factory cost in the United States. The protective tariff, it is alleged, should be equal to the difference in the cost of production in the two countries. In the concrete case above noted, a duty of 33⅓ per cent on the Dutch article would make it cost 20 cents when laid down in America, and thus the American manufacturer would be able to meet his competition on even terms.

The application of this theory encounters many difficulties when the cost of production varies for the several producers, both in Holland and the United States. Then there is no one rate of duty that will exactly equalize the difference in the cost of production in the two countries. For example, suppose the cost of production in Holland ranges from fourteen to sixteen cents, and in the United States, from nineteen to twenty-one cents. The least efficient American producers will require a tariff duty of seven cents if they are to be enabled to compete with the most efficient Dutch producers, but the most efficient American producers will need a duty of only three cents to be protected against the competition of the least efficient Dutch producers.

Arguments of Its Defenders. In the United States, the protective tariff was early defended as being necessary to protect industries already established, rather than to encourage new industries. This has been called the "vested-interests" argument—that an industry built under protection would fail if protection were removed. A new argument was soon to find its chief exponent in Henry Clay; this was the "home-market" theory, designed to reconcile the interests of the manufacturing and commercial North with the agricultural South and West. It is to the interests of both the farmer and the manufacturer, said Clay, to build up a system by which the farmer can find a home market for his products. The foreign markets, it was said, are more unstable; and, moreover, the different sections of the country should be bound together by a system which furthers the general interest.



From the painting by Rubens

PLUTO SEIZED PROSERPINA AND BORE HER OFF IN HIS CHARIOT

The next development in the theory of protection came during the War of Secession. The government, to raise funds, levied large and numerous internal-revenue duties, to offset these, a high protective tariff was necessary. There was, further, a considerable anti-foreign sentiment—caused by the almost universal sympathy in Europe for the Confederacy—to support a high tariff. After the war, the internal-revenue taxes were gradually removed, but the import duties being practically unchanged, the tariff became increasingly protective. A new argument was subsequently marshaled to its defense—the "wages" theory. It was argued that a high tariff created and maintained high wages, and that the removal of protection would lower wages and reduce the American workman to the level of his European brother

Summary of Arguments. The arguments of protectionists and free-traders may be summarized briefly as follows. The protectionist declares that high tariff promotes nationalism, or a closer union of a country's internal interests, builds up diversified industries, encourages attempts to develop natural resources, enables a nation to be self-dependent in times of war, promotes a home market, which is always surer and steadier than a foreign market, saves the farmer the cost of transportation to distant markets, and assures higher wages

The free-trader declares that protective rates are a violation of man's natural rights to buy and sell wherever he will, and equivalent to paternalism, a term meaning the tendency of a government to control too closely the activities of its citizens The free-trader maintains that protection does not promote nationalism and points to Great Britain as proof. He denies that protection causes diversity of industries in a country like the United States, where innumerable natural resources offer opportunities Moreover, he points out that labor comes in competition, not with commodities, but with other labor, and American labor secures more wages, not because of tariff, but because it is more efficient Again, it is maintained that the price of supplies is so high under protective rates that the American procures no more for his high wages than the Englishman. Protection, say its opponents, endeavors to compel a nation to produce what it is not well adapted to produce, and thus lessens the sum total of the world's fruitfulness. Also, according to later opponents, protection fosters monopolies by shutting out international competition, and fattens certain great manufacturing combinations by compelling American citizens to pay more for goods than these same combinations, selling abroad, charge foreigners Finally, tariffs stir up controversies between nations, and thus become the cause of wars. The tariff question has been the subject of political battle for more than a century of America's existence, and the end of the strife is not yet in sight. See FREE TRADE. E.J.

PROTECTIVE COLORATION, widely but less correctly known as MIMICRY, is one of the greatest factors in the life of animals and plants for protection in the struggle for existence. Colors in nature are not always merely marks of distinction of species or attractions to ensure reproduction, but are also protection against natural enemies. Fish are darkly colored on top and light underneath, as a protection against enemies above or beneath them; some are colored like the weeds among which they live. Frogs and snakes which live in green foliage are colored a similar green. Birds, reptiles, and animals of the desert are mottled gray, or are sand-colored Some hares, rabbits, weasels, and other animals which live in cold climates change their earth-colored coats to coverings of white when snow and ice are on the ground Another example of changing coloration is the interchange of colors in the skin of the chameleon. Everywhere will be seen protective coloration in harmony with surroundings and habits, from green caterpillars scarcely distinguishable from blades of grass, to brownish lizards on fence rails, white polar bears in Arctic snows and slaty-blue sea gulls, the color of the sea

Most wonderful and striking protective resemblances are seen, however, in structure as well as color, especially among the more delicately constructed creatures of the world, the moths, butterflies, and other insects. The *kallima*, or dead-leaf butterfly, of India, settling on a twig and folding its wings, looks exactly like a dead, dried leaf Many butterflies, fluttering about, look like falling leaves The common walking-stick insect looks so much like a twig it is almost impossible for an observer to discover it even when looking directly at it. Some insects resembling other objects in nature lure to themselves the prey they require as food For instance, an Indian insect called the *praying horse* looks like an orchid, and smaller insects, attracted to it, are caught Some fly-catching birds of Brazil have flower-like crests which attract their prey This form of color resemblance also appears among carnivorous, or insect-eating, plants The pitcher plant looks so much like a decaying piece of liver that insects are easily enticed into its deadly folds. Another plant illustration is that of desert cactus, which is afforded protection through its resemblance to poisonous euphorbias

Another strange form of protective coloration—the form which suggested the term *mimicry*, although it does not appear through any act of the insect—is illustrated by the viceroy butterfly It is an edible butterfly not distasteful to birds, but, though not closely related

COLOR *is their* PROTECTION



to the monarch butterfly, which birds will not eat, resembles the monarch so closely that it is protected from its bird enemies. Numerous defenseless moths and flies are colored so much like stinging bees and wasps that they are avoided by their natural enemies.

Although many theories have been advanced to explain these facts, the generally accepted belief is that they are not the results of voluntary acts by the animals. They are the results of natural selection. Year after year, through the centuries, those individuals which were not well protected were destroyed, and creatures with the most effective coloration lived and were reproduced R H

Related Subjects. The reader is referred in these volumes to the following articles

Chameleon Pitcher Plants Walking Stick

PROTECTIVE TARIFF. See TARIFF, PROTECTION.

PROTECTORATE, *pro tek' toh rate* When the larger and more powerful of two countries exercises control over the smaller, and assumes the responsibility of directing its most important affairs, the latter is said to be a *protectorate* While the word is used rather loosely, it is generally understood that the relation of protectorate gives the dependent country the right to maintain a distinct and separate existence and to conduct its own internal affairs, under the general and benevolent direction of the protecting government. The exact relation between the two countries is usually fixed by treaty, which may be an arrangement between the two chiefly concerned, or the result of an agreement on the part of several nations respecting still another. In the latter instance, the term *mandate* is often applied (see MANDATED TERRITORIES). It is always understood that the protecting country controls the international relations of its dependency; also, that it is responsible for protecting the smaller country from onslaughts of enemies.

Great Britain, France, Belgium, and other European nations possess protectorates in Africa; some that were formerly protectorates are now treated as colonies. See AFRICA (Division into Countries) and colored map

PROTEIDS, *pro' te idz*, a word practically synonymous with *proteins*. The latter term is in more general use. See PROTEINS.

PROTEINS, *pro' te inz*, a class of food substances whose special work is the building of tissue and the repair of broken-down cells. Secondarily, they furnish heat and energy. Proteins are the only organic food compounds that contain nitrogen, in addition, they are made up of carbon, hydrogen, and oxygen, and they also contain small amounts of mineral matter. White of egg, the curd of milk, the gluten of wheat, and muscle fiber of meat are typical proteins While protein foods as a group are indispensable in the human diet, the fifty or more different proteins which have been studied and analyzed are known to vary considerably in their nutritive value. It has been found that proteins can be resolved into about a score of simple digestion products called *amino acids*. These substances show great diversity in their power to further the growth and maintenance of tissue. For example, gelatin, a protein animal jelly, is readily digestible and capable of being served in an appetizing manner, but it lacks three amino acids that are essential for growth. Hence it is low in nutritive value. Milk and corn are both important protein foods, but neither has the combination of amino acids that would make it a perfect food for growing creatures. Used together, the two foods provide a much better ration because one supplies what the other lacks.

Proper selection of the kinds and amounts of protein foods is one of the basic problems in dietetics. While the building of tissue is a vital function of proteins, only a small part of the amino-acid content absorbed from the digestive tract is used for this purpose. The remainder is burned to furnish heat and energy Whatever protein material is not used is eliminated by the organs of excretion. None is stored for future use. These facts are the basis of the warnings about eating too much protein We can derive heat and energy more economically from fats and carbohydrates; furthermore, excess protein consumption puts a strain on the excretory organs. Especially is it unwise to eat immoderately of one kind of protein food. E.V.M'C.

Related Subjects. For further discussion, see the article NUTRITION See, also, FOOD, BIOCHEMISTRY, BOTANY (Contributions to Human Welfare)

PRO TEMPORE. See SENATE.

PROTEROZOIC, *prot ur o zo' ik*, **ERA,** the second era of geologic time, succeeding the Archeozoic and succeeded by the Paleozoic Era. The name, taken from the Greek, means *pertaining to early life*. A great series of stratified rocks was formed, which in some districts have a thickness of more than 30,000 feet. Groups of igneous rocks, partly of volcanic origin, are intercalated (inserted) between some of those of sedimentary rocks. Some geologists do not divide the era into periods, and the United States Geological Survey uses the name Algonkian System for the Proterozoic rocks as a whole. Many geologists subdivide the system into the Huronian, Animikean, and Keweenawan series. The Animikean is of special interest, for it contains the great deposits in the Mesaba and Iron ranges that are now a chief source of supply of iron ore for the world.

The life of the era has been the subject of much research. The fossils indicate that, early in the era, marine algae were abundant, and that later several classes of invertebrate animals, especially protozoans, sponges, and worms, made their appearance. See ALGONKIAN SYSTEM; CAMBRIAN PERIOD; GEOLOGY (Divisions of Time). L.LAF.

PROTESILAUS, *pro tes ih la' us,* in Grecian mythology, one of the chiefs who joined in the expedition against Troy. An oracle had foretold that the first Greek who attempted to land would meet death immediately; and Protesilaus, seeing that the other chiefs hesitated, leaped ashore and was instantly slain. See TROY.

PROTEST. See NOTE; CHECK.

PROTESTANT, *prot' es tant,* the general name for all Christian bodies outside the authority of the Roman or the Greek Catholic Church. Adherents of the Church of England are, strictly speaking, Anglican Catholics, and not Protestants, but the term is commonly applied to them as well. The Protestants now number about 200,000,000, including church members and adherents not formally affiliated with special denominations. The term was first used in 1529, when an edict of the Diet of Spires threatened the German Reformation with extinction. This assembly decreed that the Scriptures should be expounded only on the lines authorized by the Roman Catholic Church, and endeavored to restore the Mass in states where it had been discontinued. Several princes and fourteen imperial cities made a formal protest against the edict, and from this circumstance became known as *Protestants.* The name soon came to mean all those who followed Luther. Later it became the general term for all members of the Christian Church outside of the Catholic branches.

Related Subjects. The subheads *Religion,* in the articles on the various countries, states, and provinces, contain material of interest in this connection, as do also the following articles.

Adventists
African Methodist Churches
Anabaptists
Anglican Church
Baptists
Chaplain
Christian Endeavor, Young People's Society of
Christian Science
Church of England
Congregational Church
Covenanters
Deaconess
Disciples of Christ
Dukhobors
Dunkers
Episcopal Church
Epworth League
Evangelical Alliance
Evangelical Church
Free Methodists
Greek Church
Huguenots
Lutherans
Mennonites
Methodists
Missions and Missionaries
Moravian Brethren
Nonconformists
Predestination
Presbyterian Church
Quakers
Reformation, The
Reformed Church
Religion
Salvation Army, The
Shakers
Swedenborgians
Thirty-nine Articles
Unitarians
Universalists
Volunteers of America
Wesleyan Methodists

Biographies of the following Protestant clergymen and religious leaders are also given in these volumes:

Abbott, Lyman
Asbury, Francis
Beecher, Henry Ward
Booth (family)
Brady, Cyrus Townsend
Brooks, Phillips
Burdette, Robert Jones
Calvin, John
Campbell, Alexander
Channing, William Ellery
Clark, Francis Edward
Cotton, John
Coverdale, Miles
Cranmer, Thomas
Drummond, Henry
Dwight, Timothy
Eddy, Mary Baker
Edwards, Jonathan
Fox, George
Harvard, John
Heber, Reginald
Huss, John
Hutchinson, Anne
Knox, John
Latimer, Hugh
Laud, William
Luther, Martin
Mather (family)
Melanchthon, Philipp
Moody, Dwight Lyman
Raikes, Robert
Ridley, Nicholas
Sheldon, Charles M.
Spurgeon, Charles H.
Sunday, William A.
Talmage, Thomas De Witt
Taylor, Jeremy
Toplady, Augustus M
Tyndale, William
Vincent, John Heyl
Wesley (family)
Whitefield, George
Wilberforce, Samuel
Williams, Roger

PROTESTANT EPISCOPAL CHURCH. See EPISCOPAL CHURCH; CHURCH OF ENGLAND.

PROTEUS, *pro' tuse,* or *pro' te us,* in Greek mythology one of the lesser gods of the sea, who possessed the gift of prophecy and had in common with all the gods the power of changing to any shape in which he wished to appear. When asked to prophesy, he invariably refused, and to startle the questioner, changed rapidly through a bewildering variety of forms. To those who persisted in their questioning, however, he always in the end gave answer.

PROTOACTINIUM, *pro toh ak tin' ih um.* See CHEMISTRY (The Elements).

PROTON, *pro' ton.* See ATOM; ATOMIC THEORY; ATOMIC WEIGHTS; CHEMISTRY (Structure of the Atom), MATTER; ELECTRICITY; ELECTRIC BATTERY (How a Primary Battery Works), CURRENT, ELECTRIC.

PROTOPLASM, *pro' toh plaz'm,* a colorless, syrup-like substance, the physical basis of living matter, both plant and animal. The unit of structure in all plant and animal tissues is the cell, which is a bit of protoplasm enclosed by a membrane. Some cells are surrounded by a wall, which is hard in plants and soft in animals. Most cells consist of two sections, a denser bit of protoplasm in the center, called the *nucleus,* and a thinner protoplasm outside, called *cytoplasm.* Both nucleus and cytoplasm are very complex (see CELL). The cell membrane protects the protoplasm from surrounding material, and controls the interchange of food and waste products. Similarly, the membrane of the nucleus permits exchanges between its protoplasm and that of the outer part.

Protoplasm is not one particular substance with a definite chemical composition. It is a mixture of several different compounds, whose composition varies from one cell to another or from tissue to tissue. The most important

constituents are proteins, compounds of carbon, hydrogen, oxygen, and nitrogen. Sulphur, phosphorus, and other minerals are found in protoplasms, and water is present in large amounts. In some protoplasms, fat and carbohydrates are associated with the proteins; these compounds contain no nitrogen. Carbon is apparently the essential or key element in whatever compounds are present.

This summary of the make-up of protoplasm does not explain why it is the life of the cell. That fact is still hidden from science. The same elements are found in inert matter, but in living matter they are arranged in such a way that certain chemical reactions take place. These reactions make possible the activities we recognize as belonging only to living objects, but the ultimate reason for this result is not known.

The general properties of protoplasm are exemplified in the activities of a one-celled animal like the amoeba. This minute creature —itself simply a mass of protoplasm—has the power of spontaneous movement; it is irritable, that is, responsive to changes in temperature and other stimuli (the sense of feeling in elementary form); it can assimilate food and throw off waste matter; it breathes; and it reproduces itself by cell division. Thus, all the fundamental processes that are performed by higher animals by means of well developed organs are carried on in the cell of protoplasm—the "start of life." R.H.

Related Subjects. For important supplementary material the reader is referred in these volumes to the following articles

Amoeba	Cell	Spontaneous
Biogenesis	Colloids	Generation
Biology	Evolution	Zoology

PROTOZOA, *pro toh zo' ah.* Young people, when they begin laboratory work in zoölogy, commence usually with the study of the amoeba. This minute creature is the simplest type of the branch Protozoa, which contains all one-celled animals. These are the lowest forms of animal life. The name is derived from the Greek and means *first animal.* Most protozoans can be seen only with a microscope, and nearly all live in water. The vital functions are performed by them in the most elementary way. In case of the amoeba and others of its type, the processes of eating, breathing, and feeling are carried on by the entire cell mass, for there are no special organs. These forms move about by thrusting out portions of the cell body and drawing the rest of the mass after these projections, or "false feet." Other classes of Protozoa have specialized cell organs for these functions, such as the hairlike cilia of Infusoria, used for locomotion; and the mouth openings, with pulsating membranes and skeletal supports, seen in other types.

Some protozoans reproduce by an even cell division, each half of the original cell becoming a separate animal; with others, the parent cell puts forth a protuberance which breaks off and forms a new organism. This process is called *budding.* Certain parasitic forms, such as the organism that causes malaria when introduced into the blood of a human being, multiply by dividing simultaneously into many smaller cells called spores. In all these cases, however, there occurs a regular and even division of the *nucleus.*

The oceans contain countless millions of protozoan organisms, and it is interesting to know that these myriads of one-celled creatures are an important source of food supply for marine animals. Many of the ocean protozoans have the body cell enclosed in a tiny shell of wonderful delicacy and beauty (see RADIOLARIA). Accumulations of the shells of one order (*Globigerinae*) cover large sections of the floor of the Atlantic, appearing like thick masses of a slimy, gray mud; some of the world's largest chalk deposits are composed largely of the fossil shells of marine protozoa. There are parasitic forms that cause serious diseases of man and animals. S.H.S.

Related Subjects. The reader is referred in these volumes to the following articles

Amoeba	Infusoria
Biology	Protoplasm
Cell	Zoölogy (How Zoölogy
Disease (Germ Theory)	Affects Human
Epidemic	Welfare)

PROUDHON, *proo dawN',* PIERRE JOSEPH (1809-1865), a well-known French socialist, born at Besançon and educated in the college there. After an unsuccessful attempt to establish a printing business, he turned to literature and published, in 1838, his *Essai de grammaire générale,* receiving, in recognition of its excellence, a three-year pension of 1,500 francs from the Academy of Besançon. Two years later, he lost the approval of the Academy by the publication of *What is Property?,* wherein was contained the socialistic answer, "Property is theft." His pension was threatened, but he was able to retain it until it expired. In 1842, on the appearance of a similar publication, he was prosecuted at Besançon, but was acquitted.

For three years, Proudhon was in charge of a water-transport system on the Rhône and Saône, with headquarters at Lyons, but in 1848 he went to Paris and took an important part in the revolution of that year. He felt that the people were unprepared for the revolution, and that, had it come a little later, more complete reforms might have been effected. His views as published in the papers which he edited were more influential than was his work in the Constituent Assembly, of which he was a member. In 1849 he tried to found a People's Bank which should be run according to his economic principles, but was forced to close the institu-

tion and escape to Geneva because of the opposition of the authorities to his theories. On his return, his violent utterances led to his imprisonment for three years, and after his release he removed to Brussels, where he lived for eight years. Proudhon is one of the important figures in the history of socialism (which see).

Summary of His Theories. Proudhon's theories aimed at social and economic reforms, rather than political, and his cardinal principles were justice, liberty, and equality. He believed one person's time was equal to another's, and, therefore, that remuneration should be the same for eight hours of ditch-digging as for eight hours of plumbing. The inequality of abilities he believed would gradually diminish, and he would pay the worst laborer the same as the best for an equal duration of work Property and capital were his main points of attack; he declared them wrong because they profited without labor, and received without giving. He was impatient with those who looked for a rapid change of the present order of things, and advocated progressive reforms The dignity and personality of the man must not be impaired, nor his development hampered Proudhon believed that the point would soon be reached in the moral progress of man when government would be no longer necessary He declared government an oppression, and is often called the father of anarchy. Anarchy, he explained, was a system whereby all the restraint came from within man, and order was maintained by good manners and not outside interference or arbitrary regulation. A person might produce and use what he produced as he pleased, but he must not enjoy the fruits of another's labor and remain idle.

PROVENÇAL, *pro vahN sal'*, **LANGUAGE AND LITERATURE,** the form of speech and writings of the people of medieval Southern France, particularly of the region called Provence. This is the *langue d'oc*, which was superseded by the *langue d'oil*, as the literary language of France. See FRENCH LANGUAGE AND LITERATURE.

In the early part of the Middle Ages, Provençal poetry (see TROUBADOUR) had considerable vogue in Europe, and there have come down to us the lyrics of more than 400 poets of that school. Most of the poems were love lyrics, peculiar to life in the Middle Ages, and sung to the court ladies of Southern France. Another type was a moral, religious, or political theme written to the tune of a popular air. Students of medieval provincial life find these poems interesting sources for the history and manners of these people.

The Provençal language as a literary medium began to decline about the year 1200, but it never wholly died out, and in the nineteenth century, a society of literary men was organized to labor for its restoration and preservation. Many French poets of high rank have figured in this movement; the society is called the *Félibrige*, and its members, the Félibres. The language used by these modern Provençal poets is not that of the medieval troubadours, but represents several modern dialects that have developed from the original tongue of Southern France.

PROVERB, a short, terse sentence, long in common use, which expresses some truth or some bit of practical wisdom. Sometimes a proverb may be the saying of one man, which has been generally adopted and made a part of everyday speech; far more frequently, it is a gradual growth, like the ballad or folk epic, and has been built up by a number of authors.

Every language, so far as known, has proverbs, and frequently the same one is found current among several different peoples. In some instances, these may all be traced to a common source, or at least a common source may be inferred; but in other cases, similar experiences and observations by widely separated peoples account for the similar proverbs. Thus, Sterne's "God tempers the wind to the shorn lamb" is identical in sentiment with the old Turkish proverb "God makes a nest for the blind bird," with which it was probably not at all connected in its origin.

The Bible contains an entire book of Proverbs (which see), and many of those which are most common are from that book, as—

Stolen waters are sweet
Hope deferred maketh the heart sick.
A soft answer turneth away wrath.
Pride goeth before destruction
Heap coals of fire upon his head.

Outside of the Bible, no other book contains so many proverbs as *Don Quixote*. These were not original with Cervantes, but were collected by him from the sayings of the peasants. Franklin in his *Poor Richard's Almanac* (which see) made use of many proverbial expressions, some of which he adapted, some of which he coined; and a great number of these are still in general use. The making of proverbs is commonest in the early days of a people's history, and though to-day many epigrammatic statements find a place in books and in newspapers, few of them become widespread enough to be classed as proverbs. See EPIGRAM.

PROVERBS, a book of the Old Testament containing a collection of short poems, epigrams, and proverbs, known as the "Wisdom Literature," and having for its purpose instruction in the choice of wise rather than foolish living. It surpasses all other books in this form of literature. An exquisite example of the poems the book contains is that of *The Ant and the Sluggard* (VI, 6-11):

Go to the ant, thou sluggard;
Consider her ways and be wise·
Which having no guide,
Overseer,
Or ruler,
Provideth her meat in the summer,
And gathereth her food in the harvest.

How long wilt thou sleep, O sluggard?
When wilt thou arise out of thy sleep?
Yet a little sleep,
A little slumber,
A little folding of the hands to sleep·
So shall thy poverty come as one that travcleth,
And thy want as an armed man.

The typical proverbs are marvelously clear in their expression, are marked by brevity, and many are written in the Oriental style known as parallelism, as:

A good name is rather to be chosen than great riches,
And loving favour rather than silver and gold
(XXII, 1)

Many writers of modern times study the *Proverbs* to learn the art of forceful, brief, pointed expression.

Though ascribed by tradition to Solomon, the book of *Proverbs* is thought by modern scholars to have been written by different authors and at different times, and to represent an assemblage of several collections of proverbs.

PROVIDENCE, R. I., the capital of the state, the county seat of Providence County, and the second city in size in New England. It is situated at the head of navigation on Narragansett Bay, twenty-seven miles from the Atlantic Ocean, and forty-four miles southwest of Boston. Providence maintains a large coastwise shipping trade and has important oil, lumber, and other marine interests. Population, 1928, 286,300 (Federal estimate).

General Description. Providence is irregularly laid out on seven hills Because Rhode Island played an important part in the activities of the Revolution, the city has many historic sites. The Seekonk and Providence rivers mark the eastern boundary of the city, while the Providence and Mohassuck rivers divide the northern portion into the east and west sides The newer business district lies along the western bank of the Providence River. The names of many of the older streets—Power, Benevolent, Benefit, Friendship, Peace, and Meeting—reflect the strong Quaker element of the early residents. Providence is substantially built, and treasures several palatial mansions of colonial architecture, many with walled gardens. On Meeting Street is the Old Friends Meeting House and the original home of Brown University, so closely connected with the history of the city and of the Baptist Church in America (see BROWN UNIVERSITY).

Parks and Civic Center. Roger Williams Park covers over 400 acres and has within it a statue in memory of Roger Williams, a Natural History Museum, a Temple of Music, fountains, and rose gardens. Among the other parks are Davis, Blackstone, Barrington, Columbus, Neutaconkanut, and Lincoln Woods, with its 450 acres of wild woodland. The Civic Center, known as Exchange Place, is the real center of the city, and around this area the most notable business and administration buildings are placed. These include the State Capitol on Capitol Hill, the most imposing building in the state, the Federal building which houses the custom house and postoffice, the city hall, the Arcade, and the Butler Exchange buildings.

Historic Churches and Buildings. Providence abounds in old churches. The Unitarian, erected in 1816, has a bell cast by Paul Revere and his son; Saint John's Church, formerly King's Church, existed before the Revolution. The First Baptist Church was founded by Roger Williams, the pioneer missionary to the Indians. The bell of this church originally bore the inscription·

For freedom of conscience the town was first planted;
Persuasion, not force, was used by the people;
This church is the eldest, and has not recanted,
Enjoying and granting bell, temple, and steeple.

Among the historic buildings are the John Brown House; the Stephen Hopkins, whose owner was ten times governor of the state; the Esek Hopkins, named for the first commander in chief of the American navy; and the "Sign of Shakespeare Head," where William Goddard, the founder of the United States Postal Service, and John Carter first printed the Providence *Gazette.*

Museums and Libraries. The Rhode Island School of Design is one of the great textile and jewelry schools of the world. There is also a series of galleries devoted to sculpture, paintings, pottery, furniture, and an interesting Chinese collection The Pendleton House is noted for its colonial furnishings. Among the libraries are the Athenaeum, the John Hay, the Rhode Island Historical, the John Carter Brown, the Ann Marie Brown, and the Shepley.

Education. Brown University is the most famous of the many educational institutions of the city, and was one of the colleges in the United States founded before 1776. Other colleges include Providence College, a Catholic institution opened in 1919, and Rhode Island College of Education, formerly the State Normal School.

Transportation. Providence is served by the New York, New Haven & Hartford Railway, and by steamboat lines to New York, Philadelphia, Baltimore, and Norfolk. The harbor and its approaches have been improved by the Federal and state governments, and there are over sixty private wharves. The city also has direct connection with Newport, Narragansett Pier, Watch Hill, and other noted summer-resort sections

Industries. Industrially, Providence is a center for cotton, woolen, machine, and tool factories The Gorham Company is engaged here in the manufacture of gold, silver, and bronze Here, also, began America's great jewelry industry Other manufactured

Outline on the Province

I. Location

(1) Latitude
(2) Longitude
(3) Boundaries
  (a) Natural
  (b) Artificial

II. Size

(1) Length
(2) Breadth
(3) Area
  (a) Actual
  (b) Compared with that of states and other provinces

III. Physical Features

(1) General surface facts
  (a) Mountains or hills
  (b) Plains
  (c) Watersheds
(2) Effects on climate
(3) Drainage
  (a) Rivers
  (b) Lakes

IV. Climate

(1) Conditions that might be expected, owing to latitude
(2) Variations and their cause
(3) Rainfall
(4) Healthfulness or unhealthfulness

V. Resources and Industries

(1) Minerals
  (a) Varieties
  (b) Location
  (c) Rank among provinces
(2) Agriculture
  (a) Crops
  (b) Stock-raising
  (c) Dairying
  (d) Rank among provinces
(3) Fisheries
  (a) Sea or inland
  (b) Rank among provinces
(4) Manufactures
  (a) Principal articles produced
  (b) Rank among provinces

VI. Transportation and Commerce

(1) Railways
(2) Rivers and canals
(3) Commercial centers
(4) Value of trade

VII. The People

(1) Population
(2) Density
(3) Race
  (a) Native Canadians
  (b) Foreign-born
(4) Rate of increase
(5) Special characteristics

VIII. Government

(1) Departments
  (a) Executive
  (b) Legislative
  (c) Judicial
(2) Representation in Dominion Parliament
(3) Special features
(4) Provincial institutions

IX. Education and Religion

(1) Public school system
(2) Institutions of higher learning
(3) Churches represented
  (a) Dominant religion

X. History

(1) Exploration
(2) First settlements
(3) Interesting events
(4) Admission to Dominion
(5) Recent progress

products include screws, files, and rubber and elastic goods, and there are factories for the dyeing and finishing of textiles.

History. Providence was founded in 1836 by Roger Williams, after his exile from Massachusetts for his religious beliefs (see WILLIAMS, ROGER). Tradition says, that when he landed on the shore of the Seekonk River, he was greeted by the Indians with the salutation "What cheer, Netop" (Netop meaning *friend*). Having arranged for the purchase of a tract of land with Canonicus and Miantonomo, the Indian sachems, Roger Williams built his house and named the place Providence in recognition of his divine guidance thither. Providence was chartered as a city in 1832, and until 1900 was one of the two capitals of the state, Newport being the other; but since that date it has been the sole capital. A zoning ordinance was adopted in 1923, and the city water supply has recently been increased by the $20,000,000 Scituate dam on the upper Pawtuxet River.

PROVIDENCE COLLEGE. See RHODE ISLAND (Education).

PROVIDENCE PLANTATION. See RHODE ISLAND (History).

PROVIDENCE RIVER. See RHODE ISLAND.

PROVINCE, *prov' ins.* This term, in its Latin form *provincia*, was first used in Roman times, to indicate a conquered district which was governed by an official sent out from Rome. The name came from the same root as the verb *to conquer*, and thus could not be correctly applied to a free and independent state; but this shade of meaning was lost, and in the Middle Ages, sovereign states which united to form a greater state frequently made use of the name. Thus Holland, after it freed itself from Spain, was called the United Provinces. In modern times, in certain European countries, as Italy and Spain, a province is one of the units into which the country is divided for purposes of local government.

The Canadian Province. When the term is used without qualification in North America, it is understood to refer to one of the divisions which go to make up the Dominion of Canada. There are nine of these, in addition to two territories. Some of them are very large, one has an area of little more than two thousand square miles; but the greatest one has no more right to be considered a sovereign state than the smallest. In all essential matters of government, they are alike, and each has precisely the same relation to the central or Dominion government.

[For a discussion of the government of a province, see the article CANADA (Provincial Government); also, see *Government* in the articles on the various provinces.]

Necessity for Such Divisions. Before taking up the study of a province as a political unit, the pupil will want to know the reason for

the division of the country into such comparatively small districts. The provinces did not simply "happen"; various causes, political, geographical, historical, determined the boundaries, to be sure; but the necessity for such a subdivision has been proved by the history of centuries. No large country can be successfully governed as a unit; this statement holds true throughout the world.

Even though the capital of the Dominion were placed exactly in the center, and were given excellent communication with all parts of the country, the hundreds of thousands of square miles which make up Canada could not be properly governed from that one point. Close to the capital, no doubt, the system would be most efficient, every one would find his interests protected, and his rights assured. But in distant regions, supervision would be certain to relax and firm control to cease, and this would be increasingly the case as the distance from the governing center became greater. Division into provinces has been found to do away with this difficulty.

That this efficiency of administration is the true reason for the creation of provinces may be seen from the fact that the Dominion government takes over only such rights and such powers as the best interests of the provinces demand. In such matters as affect the people in their relation to the province, the central government yields its control to the provincial authorities, assuming the direction only in such matters as concern all the people of all the provinces. In effect, each province is the supreme authority so far as the everyday needs of its people are concerned. R.H.W.

PROVINCETOWN PLAYERS. See DRAMA (Modern Tendencies).

PROVO, *pro' vo,* UTAH. See UTAH (back of map).

PROVO RIVER. See UTAH (Rivers and Lakes).

PROVOST, *prov' ust,* a city official in Scotland, corresponding to the American mayor, the French maire, and the German burgomaster. See MAYOR; BURGOMASTER.

PROXIMA CENTAURI, *prok' sih mah sen taw' re.* See ASTRONOMY (Distances That Defy the Imagination); CENTAURUS.

PROXY. To vote by proxy is to vote by means of a legal substitute. If a stockholder in a corporation is unable to attend a meeting of the corporation in a distant city, instead of foregoing his right to vote, he may send a formal request to some other stockholder asking him to vote in his place. This procedure is called *voting by proxy.* The person who casts the vote is the proxy, and the paper which authorizes him is also known by the same term. Two of these papers must be drawn up, one for the person represented, and one for the proxy.

The use of a proxy is confined almost entirely to business meetings. It is most commonly used by small stockholders of large corporations, each of whom has a right to vote but may be unable to attend meetings. Stockholders of national banks may vote by proxy, but no officer, clerk, teller, or bookkeeper of the bank may act as proxy. Voting by proxy is absolutely forbidden at all political elections instituted by law, although an informal voting by proxy is practiced at political conventions. Marriage by proxy in the past has not been unusual, particularly in the case of royalty, but it is rare to-day. Sometimes it happens that a woman is to marry a man in some far-distant country; it is desired that marriage shall take place, but neither can travel so far for the ceremony. In such a case, the man in due form may authorize a friend to act as his proxy, and the marriage can be thus solemnized. F.H.E.

PRUDENCE ISLAND. See RHODE ISLAND.

PRUNE. There are certain kinds of plums that are especially adapted for drying, and when properly treated, are marketed as prunes. A prune plum is one that can be dried unpitted without fermentation around the stone. It also contains considerable solid matter, including a high percentage of sugar. In the western parts of America, all plums suitable for drying are called prunes while they are still on the trees, just as, in some localities, cucumbers are called pickles while they are still on the vines. There was a time when the finest dessert prunes were nearly all grown in France, but now California, Washington, and Oregon have a larger production than all foreign countries combined. The most famous French prunes come from the valley of the Loire, they are a golden-yellow, nearly transparent fruit, and are very expertly dried and attractively packed. Other countries producing prunes include Spain, Portugal, Germany, Bosnia (in Yugoslavia), South Africa, and Australia. In the United States, California has the largest output of prunes, and more of the fruit per area is produced in the Santa Clara Valley than in any other region of the world.

For successful production of prunes, a warm climate with an abundance of sunlight is needed. The trees blossom in early spring, and are sensitive to the effects of frost. Many prune-growers use orchard heaters to prevent injury to the crop when frosts are imminent. The fruits are harvested in August. They are allowed to ripen on the trees and to drop to the ground of their own accord, after which they are gathered, placed in wire baskets, and dipped in weak lye solution. This process cracks the skins and facilitates drying. After dipping in clear water to rinse, they are usually dumped on a pricking table, where they are

pricked and sorted. The fruits are then arranged on trays and exposed to the bright rays of the sun, or are evaporated by artificial heat. The latter method is employed in those sections of the Northwest where rain sometimes dampens the drying prunes. After the drying operation, the fruits are dipped into a boiling solution of glycerin and prune juice, steaming and drying in a revolving cylinder. The fruit is improved in appearance as well as sterilized by this process, and can then be kept for indefinite periods.

Prunes are a wholesome, nutritious, and inexpensive food. They contain vitamins A and B, are composed chiefly of carbohydrates and water, and have a fuel value of 1,160 calories per pound (see CALORIE). The juice of the cooked fruit and the strained pulp are safely given to very young babies. For persons of all ages, prunes have definite laxative properties, and are often recommended by physicians. See PLUM. B M D

PRUNING, *proon' ing.* If you are observant, you will see that trees having thick foliage often shed leaves through the spring and summer, though the general leaf fall does not come naturally until autumn. The leaves that are cast off early are usually found on the inside of the crown, where they cannot obtain sufficient air or water. This early leaf fall is a natural pruning on the part of the tree, and it is typical of what nurserymen and owners of orchards and gardens are doing all the time on a larger scale.

Artificial pruning—the cutting away of parts of branches, stems, buds, shoots, or roots—is for the general purpose of improving cultivated plants. A branch broken off by a windstorm is cut away, that a new one may grow in its place. Shrubs and trees in parks and landscape gardens are pruned, so they will have a more attractive appearance. Under the care of a skilful gardener, evergreens assume such fanciful shapes as beasts and birds; apple trees are made to grow like vines; and grapevines are transformed into shrubs that grow upright and are self-supporting.

Transplanted trees and flowering plants have to be pruned at the top until the roots are securely established, to prevent too great a loss of water through the leaves. Fruit-producing plants must be kept from putting forth too many buds. Larger and better fruits result when the nourishment from the plant is concentrated in a few vigorous buds, and this principle holds true for flowering plants. The extraordinary specimens of fruits and flowers often seen in exhibitions are produced by careful pruning during the budding season. It has also been found that pruning is often necessary to permit proper spraying of plants threatened with disease. Large wounds left in plants by the pruning knife should be covered with paint to protect the exposed areas from insect pests, fungus spores, and bacteria. C.F.C.

PRUSSIA, *prush' ah* (in German, PREUSSEN, *proi' sen*, derived from the Latin BORUSSIA, meaning *near Russia*), previous to November 10, 1918, the largest of the four kingdoms which, with twenty-two smaller divisions—grand duchies, duchies, and principalities—formed the German Empire. Since that time it has been a republican form of Free State, composed of fifteen provinces. Although Prussia lost about 21,644 square miles of



TERRITORY LOST TO PRUSSIA

The entire black area shows the Prussia of 1914. The peace treaty of 1919 gave to Poland the long, narrow area between the white lines in the east. More land later was lost in Schleswig-Holstein

territory and a population of 4,601,600 (according to the 1910 census), as a result of the Treaty of Versailles, it still remains by far the largest in area and population of all the states of the German republic. Furthermore, it continues to be the most important economically, politically, and historically.

The People. Three-fifths of the people of the German republic are inhabitants of Prussia. The population of 38,054,172 (1925) is greater than the total population of England and Wales. The inhabitants include the High Germans of the southwestern uplands, the Low Germans of the northern plain, many Poles, Czechs, Wends, and Mazurs in the eastern provinces, and Danes, Dutch, and Frisians in the northwest.

The rural population has been steadily decreasing, owing to the great industrial development in the urban centers, and over one-half of the population now live in cities. Berlin, the third city in the world in population, has over 4,000,000 inhabitants; Cologne, Breslau, Frankfort-on-the-Main, Düsseldorf, Charlottenburg, Hanover, Essen, Magdeburg, Dortmund, Königsberg, Stettin, Neukölln, Duisburg, and Kiel are other important cities. Berlin, Cologne, Frankfort-on-the-Main, and Hanover are described in their alphabetical

order in these volumes. For other cities, see GERMANY (Principal Cities).

The Land. Prussia's coast, which before the World War extended over 1,100 miles on the North and Baltic seas, was broken by the loss of territory now called the Polish Corridor. However, Prussia is the only division of Germany bordering the sea; consequently, it occupies the most conspicuous position in Germany's commerce and fisheries.

The eastern plain bordering the Baltic is a region of extremes of temperature. Its main crop is potatoes, which constitute one of the chief foods of the inhabitants, and are used also in the manufacture of alcohol for fuel, motive power, and light. The low, sandy coast is bordered by numerous shallow lagoons, and is separated from the inland regions by a belt of forested and lake-studded hills At the mouth of the Oder is situated Stettin, the chief port on the Baltic.

The central section of the plain is a region of lakes and waterways, and is the site of Berlin and others among Germany's great industrial cities. The valley of the Oder, the most fertile region of Prussia, produces great quantities of cereals, especially rye; three-fourths of Germany's total product comes from the fields of Prussia.

The Rhine provinces, where the birds sing in the blossoming fruit trees when the snow still whitens the fields of Eastern Prussia, is the vineyard of Germany. Along the banks of the Lower Rhine there are important manufacturing cities, such as Essen, Dortmund, and Elberfeld. In the highlands to the south are the greatest coal mines of Germany, and numerous metals, including iron, silver, copper, nickel, and lead, are mined there, Prussia leading all the German states in the production of minerals.

[The geography, separate industries, transportation, and commerce are further described in the article on GERMANY.]

Government and History

Prussia was the all-powerful state in the German Empire, because it was the largest, the richest, the most aggressive. Also, it was dominant because the king of Prussia was the hereditary emperor of the country as it existed until November, 1918. However, by the Constitution of the newly made German republic, the position of Prussia was subordinated to that of the German Reich, and the predominance which Prussia enjoys to-day is by virtue of its size and the preservation of its unity.

The constitution of the Prussian Free State, adopted in 1920, was drafted to bring about a closer union with the German republic, and to allow greater local autonomy to the divisions within Prussia. Equal, secret, and direct suffrage was granted to all citizens over twenty-one years, together with the further privileges of initiative and referendum. The diet, or landtag, is made up of deputies of the people elected for four years on the principle of proportional representation, and it is the supreme legislative body, though its decrees are subject to the will of the people. The diet elects the minister president, or premier, who appoints the other members of the cabinet. There is a state council comparable to a senate, or upper house, whose function it is to advise, control, approve, or reject the acts of the diet. The council members, who are elected by the provincial assemblies, are apportioned in the ratio of one to every 50,000 inhabitants. The ministry is made up of the minister president and seven ministers of state, and enjoys the powers formerly vested in the king; it is the supreme executive body.

For purposes of local government, Prussia is divided into provinces, government districts, urban circles, consisting of towns of over 25,000, and rural circles. A governor heads each province; a president, each government district; the towns are administered by a town council, presided over by a burgomaster.

The Foundations of the Kingdom. The history of old Prussia is a story of the great House of Hohenzollern, which ruled it from its earliest beginnings. In the fifteenth century, Frederick of Hohenzollern, an ancestor of William II, was made the Elector of Brandenburg, a vassal state of the Holy Roman Empire. The duchy of East Prussia, which had been a subject state of Poland, was added to the possessions of the Hohenzollerns of Brandenburg in 1618, and other territories were acquired by the Great Elector Frederick William (1640-1688).

Prussia first made itself known in European affairs when, in 1675, the Swedes invaded Brandenburg, and Frederick William, at the time campaigning in France, returned and succeeded in defeating and driving the enemy out of Pomerania. The conquered territory had to be given up four years later, but the effect of the episode was not lessened. At a time of intense religious controversy, Prussia became a haven for the persecuted of every creed, and when Louis XIV revoked the Edict of Nantes, Frederick William retaliated with the Potsdam Decree. As a result, immigration into Prussia increased the population about one-third. Furthermore, under the Great Elector the scattered possessions were united, and Brandenburg became the leader of the Protestant states of North Germany. He was the first of the three great rulers who laid the foundation of the militarism of modern Prussia—a policy which was forced by the exposed geographic location.

The Establishment of the Kingdom of Prussia and Its Rise in Power. In 1701 Leopold I, Holy Roman Emperor, anxious to secure the aid of his vassal princes in the War of the Spanish Succession, established a kingdom in

Brandenburg and Prussia, and Frederick III, the son of the Great Elector, was crowned Frederick I, "king of Prussia." The second king of Prussia was Frederick William I, who left an army of 80,000 of the best-trained troops in Europe and a full treasury—thanks to his close economy—to his son Frederick II, called the Great.

The first part of the reign of this great and absolute sovereign was given up to successive wars with Austria for the possession of Silesia (see SEVEN YEARS' WAR). The latter part of his reign was a period of political reorganization and development of the resources of the kingdom, and the progress of Prussia awakened all of Germany to new life and patriotism.

In the first partition of Poland among the European powers, the larger part of the province of West Prussia was added to the kingdom, thus uniting Brandenburg, Pomerania, and East Prussia. The next king, Frederick William II, who came to the throne in 1786, lost to France the Prussian territories west of the Rhine, but during his reign, the kingdom profited by the second and third partitions of Poland.

In the reign of Frederick William III, who succeeded to the crown in 1797, Prussia was crushed by the forces of Napoleon, who saw this growing power as a menace to his progress. The Treaty of Tilsit, in 1807, reduced Prussian territory about fifty per cent, but in spite of the devastation Napoleon left in his path, he stirred the people into a national awakening. Through the aid of strong ministers, the state rose against its oppressors, and in the final coalition wars against Napoleon, Prussian soldiers rendered valuable service. The end of these wars saw a new and changing Prussia; the former military supremacy was made to give way to a monarchical government, serfdom entirely disappeared, and other reforms were instituted. By the Congress of Vienna, most of Prussia's possessions were returned, while valuable territories on the Rhine were added as compensation for losses.

Frederick William IV, who reigned from 1840 to 1861, was reactionary in his tendencies, but in 1847, when the tide of democracy rose high throughout Europe, he granted the people a legislative assembly. They were not content with halfway measures, and rioting, especially in Berlin, continued until bloody fighting between the populace and the emperor's troops forced the king to yield. A constituent assembly met in Berlin, but its extreme measures frightened Frederick William. He adjourned the convention to meet later in Brandenburg, and on April 27, 1849, dismissed it entirely, himself framing a constitution much less democratic.

Meanwhile, the Frankfort Parliament, whose business it was to decide whether Austria or Prussia should be the leader of the German states, met and passed a resolution in January, 1849, declaring that one of the reigning German princes should be elected to bear the title of Emperor of Germany. Prussia's prince was the most likely candidate, and the crown was thus extended to Frederick William, who refused it because it came from the people and not their rulers. By so doing, he forfeited Prussia's opportunity to be the foremost power in German affairs. Upon the accession of William I, in 1861, Bismarck became the dominant figure in state affairs. How he brought about the organization of the late German Empire, with Prussia at the head, is told in these volumes in the biography of the statesman (see BISMARCK-SCHÖNHAUSEN).

Prussia and the Empire. In the united German Empire which Bismarck succeeded in bringing about by the Franco-German War, 1870-1871, Prussia was the dominating power, and its institutions became the pattern for the rest of the empire. The process of Prussianizing the newly acquired territory, adapting the country to the economic and social changes of the industrial revolution, and the upbuilding of a strong and powerful state occupied the time and efforts of the Prussian people up to the World War. William II was the last king of Prussia, and the last of the Hohenzollern dynasty. He came to the throne in 1888, succeeding Frederick III, who only reigned 100 days, and immediately he showed a disposition to rule the country himself and not to be dominated by a Chancellor. The brilliant career of this aggressive ruler was ended by Germany's defeat in the World War.

[For illustrations of scenes in this province, see the article GERMANY]

Related Subjects. The following articles in these volumes may be consulted in connection with a study of Prussia.

CITIES

Berlin	Frankfort-on-the-Main
Cologne	Hanover

HISTORY

Bismarck-Schonhausen, Prince	Hindenburg, Paul von
Brandenburg	Hohenzollern
Ebert, Friedrich	Holy Roman Empire
Frederick (I, II, and III, Prussia)	Poland (History)
Frederick William, the Great Elector	Seven Years' War
Frederick William (I, III, and IV, Prussia)	Succession Wars (War of the Austrian Succession)
Germany (History)	William (I and II, Germany)
	World War

PRUSSIAN BLUE, a dark-blue solid substance of coppery luster, formerly employed to a large extent in the manufacture of laundry bluing, paint, and blue ink. Aniline products, however, are replacing Prussian blue for these purposes (see ANILINE). The chemical is a compound of iron and cyanogen. It is prepared commercially by mixing ferrous sul-

phate and potassium ferrocyanide, and oxidizing the product. Prussian blue does not crystallize. It is insoluble in water, but alkalies will decompose it. See, also, PRUSSIC ACID. T.B.J.

Chemical Formula. The formula for Prussian blue is Fe_7CN_{18}, indicating a molecule composed of seven atoms of iron and eighteen of cyanogen.

PRUSSIC ACID, OR HYDROCYANIC ACID, *prus' ik, hi dro si an' ik,* a compound of hydrogen and cyanogen (which see). It is called *prussic acid* because it was first obtained from Prussian blue. The pure acid is a clear liquid, so volatile that if a drop of it is placed on glass, a part of the drop will be frozen by the cold produced by the rapid evaporation of the liquid. Prussic acid has the odor of peach blossoms or bitter almonds, and is one of the most poisonous substances known, in either liquid or gaseous form. A drop placed in the eye will cause almost instant death. Its most important compound, potassium cyanide, is extensively used in extracting gold from ore by the cyanide process. See GOLD; METALLURGY; ALMOND T.B.J.

Chemical Formula. The formula for prussic acid is HCN A molecule contains one atom each of hydrogen, carbon, and nitrogen.

PRYNNE, HESTER. See SCARLET LETTER.

PRZEMYSL. See POLAND.

PSALMS, *sahmz,* one of the books of the Old Testament, containing the religious poetry of the Hebrews, including the hymns and prayers used in public worship. There are 150 psalms, divided into five books, each of which ends with a doxology, as:

> Blessed be Jehovah, the God of Israel,
> From everlasting to everlasting,
> Amen and Amen.

The Psalms are recognized by all critics as perfect lyric poems, both in their form, which is largely that of parallelism, and in their outpouring of the finest emotions of the human soul. The *Twenty-third Psalm,* written by David in remembrance of his early life among the sheepfolds, beginning, "The Lord is my shepherd, I shall not want," can probably be repeated by more people than any other fragment of poetry. *Psalm* CXXI, given below (according to the Revised Version), illustrates the simple yet lofty style of the Psalms:

> I will lift up mine eyes unto the mountains:
> From whence shall my help come?
> My help cometh from Jehovah,
> Who made heaven and earth.
>
> He will not suffer thy foot to be moved:
> He that keepeth thee will not slumber.
> Behold, he that keepeth Israel
> Shall neither slumber nor sleep.
>
> Jehovah is thy keeper:
> Jehovah is thy shade upon thy right hand.
> The sun shall not smite thee by day,
> Nor the moon by night.
>
> Jehovah shall keep thee from all evil;
> He shall keep thy soul.
> Jehovah shall keep thy going out and thy coming in,
> From this time forth and forevermore.

The authorship of the Psalms is a matter of dispute. Popularly, they are believed to be largely the work of David. See BIBLE (The Old Testament); DAVID.

PSEUDOPODIA, *su doh po' dih ah.* See AMOEBA.

PSEUDO-SCIENCES. See SCIENCE AND THE SCIENCES.

PSITTACOSIS, a disease spread by parrots. See PARROT, subhead.

PSYCHE, *si' ke,* in Greek mythology, a princess whose beauty was so great that it aroused the jealousy of the goddess Venus, who called her son Cupid and ordered him either to kill



PSYCHE AT NATURE'S MIRROR

Psyche, or to make her fall in love with some hideous wretch. When the youthful god saw the beautiful maiden, he fell in love with her himself, and made her his wife. He kept her in a beautiful palace and visited her every night, but she never saw him, for he had told her that if she once looked upon him, he should be obliged to leave her forever. For a long time they were very happy, but at last Psyche's jealous sisters convinced her that her invisible husband was a frightful monster and persuaded her to kill him in his sleep. That night Psyche crept up to him with a lighted lamp in one hand and a dagger in the other; and when, by the light of the lamp, she saw the beautiful god, she was so startled that a drop of the burning oil fell upon his shoulder and awakened him. Seeing her standing over him with her dagger,

he guessed her intentions, and, with a reproachful word, vanished out of sight, leaving her distracted with grief.

Far and wide she sought him without avail, and many were the difficult tasks that were laid on her by Venus. At last she was sent by this hard-hearted deity to the underground realm to obtain from Proserpina some of the latter's fabled beauty. On her return journey, curiosity overcame her and she opened the box, only to be overcome by poisonous fumes. Cupid came upon her as she lay asleep by the roadside, forgave her, and after much pleading, reconciled his mother to the reunion. Then he took her up to Olympus, where she was made immortal.

As Cupid represents the heart, Psyche was thought to typify the human soul, and the trials through which she went were symbolic of the struggles through which the soul must go before it is made pure. The Greeks used the word *psyche* to mean both *butterfly* and *soul*. They thought of the emergence of the butterfly from the cocoon as a symbol of the soul leaving the body.

Modern References. References to Psyche in literature are very numerous, and it is almost impossible to read any of the poets without coming upon some mention of her An especially beautiful passage is the following, from Milton's *Comus*

> Celestial Cupid, her famed son, advanced,
> Holds his dear Psyche sweet entranced,
> After her wandering labors long,
> Till free consent the gods among
> Make her his eternal bride;
> And from her fair unspotted side
> Two blissful twins are to be born,
> Youth and Joy; so Jove hath sworn.

Related Subjects. The reader is referred in these volumes to the following articles

Butterfly (Life History)	Olympus
Cupid	Proserpina

PSYCHIATRY, *si ki' ah trie.* See INSANITY.

PSYCHICAL, RESEARCH. *si' kih kal,* The term became current in 1882 through the establishment in England of the Society for Psychical Research. The chief purpose of the founders was the investigation of phenomena suggestive of the operation of powers beyond the recognized use of the senses and the accredited behavior of matter and mind. The investigation was to include the traditional beliefs in premonitions, haunted houses, the happenings in the presence of mediums, such peculiar states as trance, hypnosis, and the existence of seemingly supernatural forces transcending the known behavior of matter. This program may not seem wholly scientific, but it corresponds to widespread interest in certain classes of occurrences, whatever their nature and explanation; these require special methods of investigation, and their proper comprehension is a legitimate function of educational interest.

The most definite problem was that of the transference of thought apart from the ordinary channels, for which the term *telepathy* was adopted. Persons appeared claiming such powers; experiments were conducted on a large scale, in which the successes of such "percipients" in guessing numbers, names, or cards were carefully recorded, and the conclusion reached that, after allowing for chance, a proportion of success remained that implied an authentic transfer. Although critical students have subscribed to these conclusions, they cannot be said to be generally accepted; on the contrary, the prevailing attitude of scientific men is that the conclusion is unwarranted. Of the elements that may account for the results, the most perplexing is the question of fraud, intentional and unintentional. Distinctly fraudulent methods were discovered by members of the society, and such results were disregarded; but it is true in a number of cases that confessions of fraud were made after the results had been accepted as genuine. Apart from the "money" interest, the desire for notoriety and the interest in deception act as motives for frauds. It has also been found that involuntary whisperings and all manner of subtle indications were subconsciously conveyed, and may afford a clue to the successes as well as to the methods employed. In such experiments, the proper allowance to be made for chance is not easily determined; the mental habits of two persons may be sufficiently alike to cause apparent transfer.

A truly formidable amount of evidence was amassed of "veridical" premonitions and apparitions, that is, such as correspond to actual happenings. A person at a distance has a sudden and strong feeling that something momentous is happening to a friend; quite as commonly, an actual feeling of his presence or the apparition of a form is reported. Later reports in many cases prove that something momentous had really occurred, and in many cases, the premonition or apparition fairly coincided with the moment of death of the absent friend. To this class of cases, the theory of telepathy was applied. Such cases offer large room for sincere error: the coincidence is often exaggerated; the remarkable details are in some cases illusions of memory, the negative instances are ignored; the fact that persons in positions of danger are naturally often in the minds of their friends would favor coincidences of thought and occurrence; some such coincidences must occur by chance; cases depending upon written records made before verification are rare.

Much reliance has been placed, by those who accept the evidence, upon the accuracy of details, some seemingly unknown to the percipient until the moment of the premonition or apparition. Some favor the hypothesis of a

spirit communication to account for the reports as rendered. Evidence of this type depends wholly upon the accuracy, scientific habits of observation, and freedom from bias of the recorders. A scientific view must conclude, in view of the contradiction which such a view presents to known action of physical and mental agencies, and in view of the extreme uncertainty of the evidence, and of the negative result of experimental proofs, that the case is not proved and inherently weak. The census of hallucinations, upon which some of the conclusions are based, suggests at once the tendency of favorable cases to be reported, and has established that such phenomena are by no means uncommon in normal individuals. That there may be a tendency among those of nervously unstable temperament to invite or favor such phenomena, and to find satisfaction in attaching significance to them, is conclusively established.

An interesting and more decisive branch of investigation includes the physical phenomena, occurring mostly in the presence of spiritualistic mediums, such as the mysterious movements of objects, the writing on slates apparently out of control of the medium, answering of questions in sealed envelopes, materializations, spirit photographs, etc (see SPIRITUALISM). Substantially all of these were found to be fraudulent, and some questionable cases have since been exposed The investigation has not been without result in showing the wide prevalence of a willingness to deceive (quite apart from self-deception), and particularly in showing how slight a departure from accuracy of description is sufficient to make a miracle out of a plain tale, and what expert knowledge is required to detect the fraud in operation.

The investigation of haunted houses, especially the cumulative account of different observers, is too complex to be summarized. It has convinced some, and seems inconclusive and suggestive of delusion to others. The persistence of such accounts, even in skeptical days, is not without interest.

Of a different type are the revelations of mediums in a trance state, usually of affairs of deceased individuals or of living ones, seemingly beyond their knowledge by any ordinary channels; often private matters of an intimate character, upon which reticence is most natural, are thus revealed. It is to be noted that such revelations are made by a few individuals, often under questionable circumstances, involving at once the suspicion of lack of good faith or of hysterical varieties of deception. The largest mass of testimony has accumulated through the sittings of Mrs. Piper, whose method is to go into a trancelike state and answer questions as well as offer information both as to the living and the departed, seemingly beyond the possibility of ascertainment by Mrs. Piper herself. Communications with those recently departed and interested in the reality of such phenomena are recorded. Spirit communication has been accepted by some investigators as the only adequate hypothesis; while others regard telepathy as adequate. It is clear that, unlike material phenomena which can be examined and exposed, this type of evidence depends wholly upon the coöperation of the "medium," who as a rule has been unable or unwilling to furnish such enlightenment. Under these circumstances, and in view of the baffling complexity of the evidence and the openings which it offers for all manner of deception, no other value can be attached to it than that of an interesting psychological manifestation.

The problems of psychical research have included a miscellaneous group of exhibitions of unusual powers, of which "crystal gazing" is an example. The ability of favored individuals to promote subconscious images, and by this means to project in pictures seen in the surface of a glass ball incidents seemingly beyond the normal knowledge, is unmistakably established. Those convinced of the telepathic or similar action see in these revelations additional proofs of their views. That the action falls in line with what is known of subconscious mechanisms is the more scientific hypothesis. While the source of the images cannot be traced in many instances, a generous allowance for the intricacy of mental action will bring the results within the normal behavior of subconscious intelligence. The same applies to "automatic writing," in which the medium of expression is either a pen or a pencil, or the spelling out of sentences letter by letter on a board (ouija board) on which the letters are alphabetically arranged, and the hand of the agent rests upon a small tripod which moves and rests upon one letter after another. Poems, narrative, and answers to questions have been thus revealed.

In reviewing the wide range of the problems of psychical research, it becomes evident that most of them pertain to the same powers as dominate the history of occult pretensions, as clairvoyance, the power to control matter at a distance and defy the laws of physics, spirit revelations, oracles, or revelations of intimate information not readily accessible, haunted houses, apparitions, trance states, and the like. The presumption remains that the methods and agencies responsible for such appearances in the past (which have been proved to be vain pretense, or capable of reasonable explanation within the accepted range of scientific hypothesis) are also adequate to account for the much more circumstantial evidence recently accumulated.

This conclusion remains the present verdict of a scientific caution. Nor can there be any doubt that the interest in establishing the reality of these exceptional forces, however

tinged or corrected by a scientific faith and training, is, after all, much of the same order as sustained the beliefs of past ages and gave rise to much superstition. The newer interest that these investigations have furthered is the psychological one in the operation of subconscious states, and in the allied mechanisms by which the possibilities of explanation and rationalization have been substantially enlarged. In many cases, it takes an emotional interest in the truth of a certain hypothesis (spiritualism) to bring about the wayward and irregular manifestations; that they may occur without this interest is a valuable corroboration of the "subconscious" explanation.

Whether one believes that the enormous labor expended in the accumulation of these data has been worth while depends upon the significance attached to the results. The issue seems to be between (1) the view of the universe on the one hand as for the most part regulated by well ascertained laws of cause and effect in the field of mind and matter, while exceptionally and under peculiar circumstances, at the agency of favored individuals, quite another realm of action takes place transcending or defying these laws and revealing relations unrecognized in ordinary science; and (2) the view that holds firmly to the all-encompassing scope of science, and holds that the seeming exceptions may eventually be accounted for by extension (particularly in the domain of subconscious mechanisms) of known forms of material and mental action.

The decision is likely to be determined by predilections and training; in reaching it, an important factor is the allowance to be made for coincidence and the scope of fraud and self-delusion. J.J.

Relating to Various Beliefs. The following articles in these volumes are of interest in this connection:

Alchemy	Necromancy
Astrology	Occult
Clairvoyance	Palmistry
Conjuring	Phrenology
Demonology	Physiognomy
Divination	Psychoanalysis
Ectoplasm	Spiritualism
Faith Cure	Subconscious
Hypnotism	Suggestion
Magic	Superstition
Medium	Telepathy
Mesmerism	Witchcraft
Mind Reading	

PSYCHOANALYSIS, *si' ko a nal' ih sis.* The term refers to recent methods of detecting the source of mental difficulties by an analysis of deep-seated subconscious conflicts (see SUBCONSCIOUS). In many cases, impediments in action, troublesome thoughts, and failures of adjustment (as well as isolated symptoms such as a recurrent hallucination, stuttering, a feeling of losing consciousness, a pain, a paralysis) have been shown to result from a mental scar left by an emotionally upsetting experience.

Many of these cases occur among hysterical patients. Freud, who is the founder of these views, says that hystericals suffer from their memories. Seemingly, they get over an emotional shock; but this leaves a liability like a scar, and any succeeding emotional disturbance sets off the original experience. It may be that cases of altered personality owe their origin to such an original shock. In a very simple case, a nervous girl at the adolescent period had a chill and spasm while bathing in a stream; this left behind a constant tendency to go through the spasmodic movements under the least excitement. The attacks were so constant that they interfered with any continuous occupation.

Most of the cases are very complex, and consist of mental fears, hesitancies, hallucinations, anxieties, and disqualifications, the source of which often remains obscure until revealed by psychoanalysis. Once rendered explicit and conscious, they are more readily opposed and conquered. What is characteristic is that, though such difficulties often seem real and physiological in nature, they yield to mental treatment. In the procedure, the subject is asked to assume a passive state and tell all that occurs to him in the account of his symptoms; one train of ideas leads to another, until a clue is found. Such a clue is often found in dreams, because a dream is an uncensored product, and, according to Freud, expresses an unfulfilled wish. It is these inner conflicts, repressions, and antagonisms that cause mental maladjustment. Many of these are of a deeply personal and emotional nature, and naturally center about the life of sex.

Psychoanalysis has also been applied to other types of suppressions, such as those of guilty action and the detection of criminals. Here the favorite method is that of association. A list of words is prepared, most of them of ordinary significance, and the time noted for each such word to arouse an associated word. These times vary, but not extremely. Here and there a clue word, or suspected word connected with the repressed idea (crime), is inserted; and the response is found to be delayed. By the analysis of such lists, the clue is found and followed. The same procedure is applied to the cases of internal impediment and conflict above described.

Psychoanalysis is but one of several methods useful in unraveling motives which lie deeply embedded in subconscious entanglements. Its recent popularity is due to the fact that so many forms of nervous disability have been baffling, and here alone in the mental realm find their solution. The operation of release—suggesting that of confession in the Church—also emphasizes the principle that strong emotional impulses and instincts must find expression, or in their repression may do

damage. This principle is of significance for educational and social measures. Unless forms of outlet are supplied for the strong passions of men, unwholesome ones will develop. The transformation of old impulses to new outlets is thus seen to be the problem which civilization imposes upon the nervous system. The disqualifications which psychoanalysis is called upon to treat represent the price that is paid in failures to meet these radically changed conditions of life. J.J.

Relating to Various Beliefs. For a list of topics of interest in this connection, see PSYCHICAL RESEARCH, above. See, also, PSYCHOLOGY (Modern Movements).

PSYCHOLOGY, *si kol' o jie.* It is only since the middle of the nineteenth century that men have made practical use of this science, which studies and explains the working of the mind. Previous to that time, psychology was so interwoven with philosophy and metaphysics that it held no interest for students of other subjects, or for men and women of affairs. Originally, each form of mental activity was considered a special power or faculty, distinct from other forms of activity, and the faculty or power of memory, the faculty of imagination, and other faculties were thus treated in textbooks on psychology. There was no attempt to find the connection between mind and body previous to 1850, and the views of the first investigators along this line of research naturally were rejected by the old school of psychologists. But in 1878 Wilhelm Wundt established a psychological laboratory at Leipzig, the first of its kind in the world, and, through a series of carefully wrought-out experiments verified the experiments of others. This led to an orderly arrangement of the new discoveries and laid a foundation for further study. Wundt continued his labors, and the value of his work was soon recognized by other psychologists, so around his discoveries there developed a new science of psychology, more human, more real, and more practical than had been known before.

Wundt has justly been called the father of modern psychology. Students from his laboratory established similar institutions in other countries, until every great university in Europe and America was equipped for the study of experimental psychology. The most celebrated of Wundt's followers in the United States was William James (which see). His *Principles of Psychology*, which appeared in 1890, was an epoch-making work, and at once attracted the attention of leading psychologists throughout the world. James vitalized psychology and attracted to its study thousands who had hitherto considered the subject dry and impractical. A leading American authority says of him:

> The chief work of James consisted in a reconstruction of psychology by resetting its problems and by exploring old as well as new fields in search of data for their solution. By his rare mastery of English and his keenness for the concrete in experience, he turned the abstract difficulties in human subjects into vital interests for the public, as well as for students in general

Modern psychology recognizes the interdependence of mind and body and the localization in the brain of various centers of action, but it draws a sharp line between physiological and mental action. While mental action may control physical, it cannot be transformed into it, nor can physical action be transformed into mental. The branch of the broad subject of psychology that is given to the study of the relation of mental activities to the nervous system has been given the name of *physiological psychology*.

Modern psychology has discarded the old theory of faculties or powers, but it is difficult to rid the science of terms that have been in use for centuries, and we often find these terms in works of recent date. The mind is considered as a unit, with the power of acting in various ways to secure specific results. Instead of a faculty of memory, for example, the mind acts to recall past experiences, and in connection with this special form of activity, other activities may be present, as feeling and will; but so long as the person is trying to recall past experiences, the form of activity which we call memory will be the strongest. This is equally true of other forms of activity. When we speak of will, we mean that activity of the mind which enables us to choose and to act. When we speak of feeling, we mean the activity through which we experience sensations of pleasure or pain.

Development of Mental Powers. Modern psychology recognizes the fact that the various forms of mental activity develop in accordance with a fixed law, and that the order of their development never varies. This order is (1) observation, (2) memory, (3) imagination, (4) thought, which includes conception, judgment, and reason. Feeling and will are present at birth, and with the other activities, increase in strength as the mind develops. A knowledge of these facts is of great importance to the teacher, who without such knowledge might set tasks for children which they do not have the mental capacity to perform. Unfortunately, such an error frequently occurs.

Classification. Psychology is classified in various ways by different authorities, but these classifications are of interest to special students only. We have already mentioned physiological psychology. *Child psychology* is devoted to the study of the mental development of children, and is generally known as *child study*. *Educational psychology* treats of the application of the laws of mental development to teaching. C.E.S.

Modern Movements in Psychology

Psychology as a science is very young. Moreover, it is going through a period of almost incredibly rapid growth. As a result, we find numerous new movements and techniques jostling the older theories and procedures, in a most lively and sometimes even belligerent fashion. Probably the best and most profitable way to secure a comprehension of this interesting situation is to consider in turn the more important movements in their relations to one another.

Animism. The most ancient of all of the views as to the nature of the mind is that known as *animism.* This seems to be the natural view of the savage and of primitive man in general. Indeed, this view seems ingrained in all of us at unguarded moments.

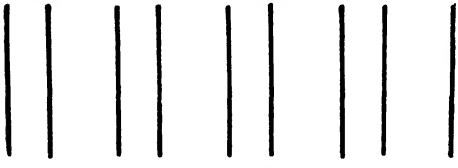


ILLUSTRATION I

It doubtless is the basis for the almost universal belief in magic, characteristic of primitive life and all too common in our present civilization. Animism regards the whole world, both animate and inanimate, as endowed with mind and, more or less, with human characteristics. Trees, animals, rocks, and rivers feel, think, will, and have purposes. Even we ourselves say, half seriously, that the river longs for the sea. But, according to this view, it is not really the tree which thinks or wills, but the *spirit* of the tree. The spirit of the volcano becomes angry, and must be appeased by prayer and sacrifice. The spirit of the animal killed for food must even be dissuaded from retaliation by a magic formula or ritual.

But, obviously, if inanimate objects and animals have spirits which guide and control their action, what more natural than that man himself should have a spirit which should control his actions, and which thus becomes the ultimate cause and explanation of all his behavior? It is upon this last principle that the modern school of animistic psychology insists. This school strenuously maintains that to have the purpose to attain a goal is a strictly mental thing which is of an entirely different order from the mechanistic principles by which the physical and mechanical events in ordinary nature are at present explained. In a similar manner, intelligence and conscious creative striving are ultimately mental, and susceptible of explanation only in mental terms. The animistic movement in modern psychology is most prominently identified with the name of William McDougall. But traces of animism are found concealed, and often unrecognized, in the systems of many other psychologists who do not regard themselves in any sense as animists. However, the modern tendency is decidedly away from animism.

Structuralism. A second modern school of psychology is known by the general name of *structuralism.* In the United States, this school has tended to center around the person and writings of the late E. B Titchener. Structuralism holds that the proper study of psychology is the analysis of the states of consciousness. It is a kind of dissection or vivisection of complex conscious states or experiences into simpler ones Thus, the experience of tasting currant jelly might be analyzed into the more elementary experiences of tasting sweet and sour, of the smell of fruity odor, of the feeling of coolness on the tongue, and so on. In a similar manner, effort in the sense of work is analyzed as a "sense feeling, made up of unpleasantness and a complex of kinesthetic and organic sensations."

Since these conscious states are essentially private affairs, the chief method of investigation has necessarily been introspective analyses. This method is obviously adapted in the main to use with intelligent adult human beings With such subjects, the method has yielded fairly consistent results only in the fields of sensation, simple feeling, attention, and action But in the fields involving processes, such as perception, memory, and thinking, there has been little success With psychopathic individuals, young children, and others, whose reports of their experiences are not trustworthy, the method obviously is of little or no value.

Gestalt Psychology. A third movement in modern psychology, one which has developed mainly in Germany, is the *Gestalt* psychology. This movement was originated by M. Wertheimer and his followers, notably W. Köhler and Kurt Koffka. The German word *Gestalt,* as used by these psychologists, can best be translated as *configuration.* As a consequence, the members of this school are frequently called configurationists in English-speaking countries. The Gestalt psychologists emphasize the wholeness of situations and experiences. They oppose the structuralists by insisting that experience cannot be satisfactorily analyzed by introspection or, indeed, by any other method ordinarily employed. They accordingly reject sensations as elements from which experiences are made. They use introspection to a considerable extent, however, though rejecting it as an instrument of analysis. They have a strong interest in the *purposive*

aspect of human nature, agreeing with the animists and vitalists that purposes can never conceivably be accounted for by mechanism.

Gestalt psychology had its origin in visual perception. What this is may be made clear by a consideration of the figure (illustration 1). When these straight lines are looked at in an ordinary manner, one spontaneously sees the pairs of lines which stand close together as distinct groups. If one makes the effort, one can probably see the pair of lines at the right, which have a longer distance between them, as a group with the shorter distance, in this case, separating the new group from the next group of the same kind. But to extend this second grouping for more than one or two groups farther to the left requires a special effort, as the reader may easily verify for himself The Gestalt psychologists believe that some kind of force holds the pairs of nearer lines together. This is very typical of the spirit of Gestalt psychology.

The manner in which the pairs of lines stand out as groups from the others and from the background of the paper illustrates the Gestalt theory that there tends in perception always to be both a figure and a ground. According to this school, the figure and the ground make up a Gestalt, or whole, which cannot be separated without mutual destruction.

A famous example illustrating the principles of whole is furnished by an experiment with a fowl. The hen was trained to peck kernels of grain only from the lighter of two gray papers. It was found that when the paper to which the pecking reaction had previously become attached was presented along with a paper still lighter, the hen now pecked from the new paper instead of the one to which it had been trained. This experiment is held to show that the hen had all the time been reacting, not to the specific paper at which she had been pecking, but to the whole situation, including the paper at which she had not been pecking.



Courtesy Harcourt, Brace & Co

ILLUSTRATION 2

While the most noteworthy work of the Gestalt psychologists has been in the field of seen groupings of figures and visual illusions of movement, they have carried out ingenious experiments in many other fields. One of the most interesting of these investigations was with a number of chimpanzees. It was found that these animals, when confronted with such problem situations as securing bananas suspended too high to reach, showed marked intelligence and insight into the solution of the problem. They would pile boxes, one upon another, until, when standing on the top of the structure, they could reach the fruit. The final stage of such an exploit is shown in the accompanying figure (illustration 2, above).

It was found that, on one occasion, an animal which knew the use of boxes for reaching bananas repeatedly ignored a box on which another ape was lying, though unable to secure the bananas without it. When, however, the second animal got off the box, the former animal seemed for the first time to realize that the box would aid him in securing the fruit. It is explained that, with the animal lying on it, the box was held to the configuration of

obvious use, which prevented it from being transferred to the configuration involving the banana. This bit of theory is, again, very typical of Gestalt psychology.

Behaviorism. Another movement in modern psychology is that known as behaviorism. This, like the Gestalt psychology, is a new movement, and one of revolt. Behaviorism has originated and centered around the writings of Max Meyer and John B. Watson, the latter at present the dominant figure. Watson was originally an animal psychologist, which doubtless has had much to do with the characteristic development of this movement.

The two main characteristics of behaviorism consist (1) of a method of investigation, and (2) of a theory of the nature of the mind. In regard to the latter, behaviorism vigorously opposes the animistic notion that man's actions are guided by a spirit. It insists that the behavior of man and animals requires no ultimate principles of explanation beyond that employed in the physical sciences. The behaviorists hold that the belief in non-physical entities, such as spirit, consciousness, purpose, will, and insight, as causal or explanatory principles, is a mere superstition inherited from a primitive culture. They hold not only that such a belief is wrong, but that it constitutes a formidable bar to the understanding of the real mechanisms of behavior and to the advancement of science.

From the point of view of methods of investigation, the behaviorists emphasize objective observations and procedures. They strenuously reject, on the other hand, the introspective analysis of the structuralists. Some behaviorists, however, employ introspection in the sense of observation with the internal sense organs of processes going on within their bodies, just as they use the eyes and ears to observe things taking place in the world outside their organisms. Thus, if the subject's arm is gently moved by someone else, he may observe this movement with his eyes. In this case, the observation would be an objective one, much the same as if he were observing the movement of another's hand. But if the eyes are closed, the subject may still observe the movement of his arm by the way the arm itself feels. In this latter case, the observation is an internal one, since it depends upon sense organs located in the arm itself.

The strong bias in favor of limiting psychological observations to objectively (visually) observed behavior was introduced into behaviorism from a school of Russian physiologists who were originally interested in animal behavior. In recent years, the members of this Russian school have extended their work to children and adults, and have come to be known as *reflexologists*. This name is suggestive of the basic mechanism upon which they have worked—the "conditioned reflex." Since the conditioned reflex has also been made the basic mechanism of the behavioristic system, and since the technique of the experiment is typical of orthodox behavioristic methods, the concrete description of a famous experiment illustrating this mechanism will be of interest.

It is well known that when a dog eats food, the mastication of the food in the mouth causes the saliva to flow from the various

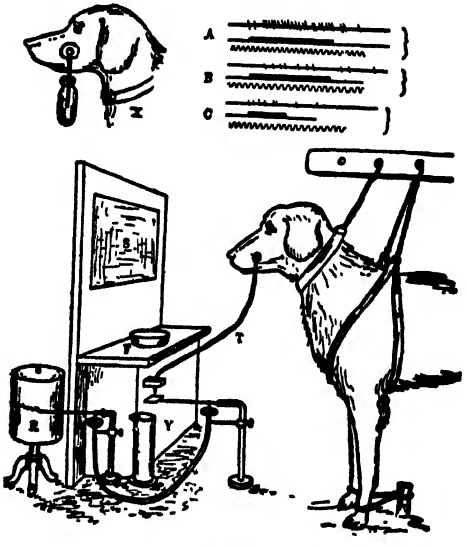


ILLUSTRATION 3

The upper left-hand corner, X, shows the graduate attached directly to a small funnel fastened over the duct of the salivary gland The lower part of the drawing shows Nicolai's method The dog is held in position by comfortable bands The tube T runs directly from the funnel over the salivary gland to the recording apparatus, Y Careful records are made at R. S shows the position of the stimulus (color, sounds, etc), and F, the food dish At A, B, and C are shown three sets of records· A, the number of drops, the total amount of the secretion, and the temporal relations when food is placed in the mouth; B, when the food is sensed by sight, smell, etc.; C, when the color green is shown after the conditioned reflex has been established. (After Nicolai)

glands. It was found possible by careful surgery to divert one of the salivary ducts so that it would discharge its saliva, not into the mouth, but through a fistula made in the side of the dog's head, as shown in the accompanying figure. As it was secreted, this saliva would fall in drops upon a mechanical device which would give a graphic tracing on smoked paper of each drop as it fell. It was found, on one occasion, that meat given to the dog produced the secretion of twenty-six drops of saliva. For a number of feedings, a green card was placed before the dog at the time of his feeding. Later, when the card alone was placed before

the dog, there resulted a flow of eight drops of saliva. This meant that the reflex response of saliva flowing had been transferred or "conditioned" to the green card. This is why such a transferred reflex is called the conditioned reflex. The conditioned reflex is especially important in the behavioristic system because most complex performances, such as instinctive action, ordinary habit, skill, problem-solving, thought, and invention, are explained on the basis of various syntheses of this fundamental unit. In the higher thought processes, language in the form of sub-vocal speech (talking to one's self internally) is supposed to be the chief mechanism by which thought is accomplished and insight and discovery are attained.

Psychoanalysis. Lastly, there may be mentioned a fifth movement in modern psychology which is rather different in nature from the ones already discussed. This movement is known as psychoanalysis. It centers around the writings of Sigmund Freud, a Viennese physician. This theory originated in the practical attempts of Freud to find a psychological cure for the milder forms of mental disorder, such as hysteria and other personality defects. Freud finally came to the conclusion that most ills of this type were caused by repression of the various natural desires. Of these repressed cravings, that concerned with the sexual life was found to be by all odds the most significant. Indeed, the Freudians hold that sex, or *libido*, as it is called, is responsible in various limited and disguised forms for the most of what is best as well as what is worst in human nature. When a craving, or an unpleasant experience associated with such a craving, has been repressed, the patient may not be able to recall the memory of the event. Yet the memory is believed somehow to go on existing in the patient's body, and may cause serious symptoms. Examples of such symptoms are the hysterical paralysis of a limb, a persistent sense of smelling burned food, or a morbid feeling of anxiety. Such symptoms may be cured by enabling the patient to remember in a vivid way the unfortunate experience which gave rise to them. The technique of restoring these memories is known as psychoanalysis. This consists, in general, of putting the patient into a relaxed attitude and talking with him in a sympathetic way concerning the various things connected with his trouble. In this connection, the patient's dreams are often used as points of departure, since they are supposed to be largely the up-flowings of subconscious or repressed wishes. As a consequence, they are held often to give clues as to the causes of the symptoms. In every large city, there are physicians who specialize in this form of treatment. C.L.H.

Related Subjects. The reader is referred for further treatment of this subject to the following articles:

Apperception	Instinct
Association, Law of	Interest
Attention	Judgment
Brain	Memory
Child	Mind
Child Study	Pedagogy
Concept	Perception
Dreams	Psychoanalysis
Feeling	Reason
Free Will	Senses, Special
Habit	Suggestion
Hallucination	Thought
Imagination	Will

The articles on the following psychologists may also be consulted

Dewey, John	Helmholtz, Hermann von
Galton, Sir Francis	James, William
Hall, G. Stanley	Münsterberg, Hugo

PSYCHONEUROSIS, *si ko nu ro' sis.* See NEUROSIS.

PSYCHOSES, *si ko' seez.* See INSANITY; NEUROSIS.

PSYCHOZOIC, *si ko zo' ik*, **ERA.** See GEOLOGY (Divisions of Geologic Time).

PSYCHROMETER, *si krom' e tur.* See HYGROMETER.

PTARMIGAN, *tahr' mih gan*, the name for certain grouselike birds found in northern regions of both continents. A characteristic feature of these birds is a covering of short feathers on the feet. Most species have several changes of plumage during the year; the winter coat is a pure white, and that of summer a mixture of reddish-brown, buff, gray, and black, the coloration serving at different seasons to protect the bird from discovery by its enemies. Ptarmigans nest among mosses on the ground. Their eggs, six to eleven or more in number, vary in color from cream-buff to reddish, and are spotted and blotched with black or dark brown. In North America are found the *willow*, *rock*, and *white-tailed ptarmigans*. See illustration, page 5870. D.L.

Classification. Ptarmigans belong to the family *Tetraonidae*. The North American species are placed in the genus *Lagopus*.

PTERIDOPHYTES, *tehr' ih doh fites*, is the name given to that division of the plant kingdom which includes ferns, club mosses, and horsetails, or scouring rushes. It is one of four grand divisions into which plants are divided on the basis of structure. These plants have real roots, as well as stems, although the latter often have the habits of rootstocks. Many of them are tropical, and in the geological period, particularly in the earth's greatest coal-forming ages, they were far more abundant than they are now. B.M.D.

Related Subjects. The reader is referred in these volumes to the following articles

Botany (Classification)	Ferns
Carboniferous Period	Geology
Coal	Horsetail Rush

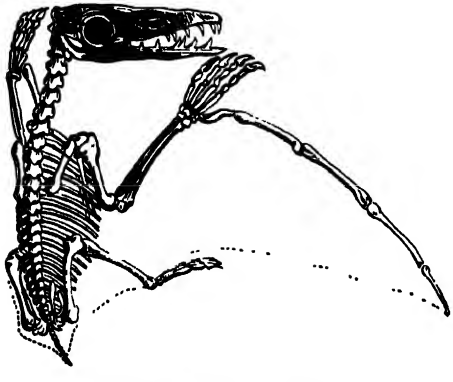
PTERODACTYL, *tehr o dak' til*, an order of flying lizards that lived in prehistoric times.



PTARMIGAN IN WINTER (SEE PAGE 5869)

These birds furnish an excellent example of protective coloration During the snowy season their feathers are white In the summer season they are brown. See PROTECTIVE COLORATION

Numerous fossil remains found in limestone formations of the Mesozoic Era indicate that there were about twenty genera of these oddly formed creatures. They had hollow bones, like birds, but in other points of structure were



SKELETON OF THE PTERODACTYL

like reptiles. The body was short, the head large, and there were two long, slender hind legs, and a pair of forelimbs. A very long tail was characteristic of earlier forms. Probably the most peculiar point of structure was the prolongation of the fifth finger of the forelimb. To this was attached a strong membrane, forming a wing which looked something like the wing of a bat. The jaws of the pterodactyls were provided with teeth and came together in a birdlike beak. In expanse of wing, these animals varied from one foot to about twenty feet. See MESOZOIC ERA; FOSSIL. W.N.H.

PTERYLAE, *tehr' ih le* See FEATHERS.

PTOLEMY, *tol' e mie,* the name of sixteen kings who ruled Egypt from 323 to 30 B C, constituting the Macedonian dynasty. Only five of them are historically important.

Ptolemy I, surnamed SOTER, or "Savior" (about 367-283 B.C), was a Macedonian Greek and a favorite general of Alexander the Great He possessed much of the genius of Alexander for conquest and organization After the latter's death, when the vast empire was divided, Ptolemy chose Egypt for his realm, and made Alexandria his capital By marriage and by conquest, he extended his territory, and during his reign Egypt became foremost among nations in commerce, the clearing house for the produce of the world To further this great trade, Ptolemy built roads and canals He was not only a warrior and an organizer, but a patron of learning as well. It was his aim to make Alexandria both the commercial center and the intellectual capital of the world, and to this end he founded the Museum and the great Alexandrian Library (see ALEXANDRIA) He also extended many privileges to teachers, philosophers, and writers. In 285 B.C. he abdicated in favor of his son, Ptolemy Philadelphus.

Ptolemy II, surnamed PHILADELPHUS (308-247 B.C.), was a peace-loving king who accomplished with honor the task of carrying out his father's plans for the commercial and intellectual glory of the kingdom. Among the achievements of his reign were the opening of a canal from the upper end of the Red Sea to the Nile, and the erection of a lighthouse on the island of Pharos This structure was one of the seven wonders of the ancient world (see SEVEN WONDERS OF THE WORLD). According to tradition, not

well founded, Ptolemy had a Greek translation made of the Hebrew Scriptures (see SEPTUAGINT)

Ptolemy III (about 282-222 B.C) was called EUERGETES, or "Benefactor," because he restored some Egyptian gods carried away by Cambyses Under this progressive ruler, Egypt reached the height of its military glory and material prosperity Ptolemy III was a patron of learning and a famous builder

Ptolemy V, surnamed EPIPHANES, or "Illustrious" (210-181 B.C), was crowned when only five years old. The kings of Syria and Macedonia promptly took advantage of this condition and proceeded to divide between them the foreign possessions of Egypt. The infant king's frightened guardians called upon Rome for help. That state, only too eager for an opportunity to interfere, forced the kings to restore most of the lands by arranging a marriage between Ptolemy and the daughter of the Syrian king, who was to have as her dowry the disputed provinces This aid was the opening wedge for the Romans, whose influence increased until Egypt became a Roman province. The coronation of Ptolemy in 196 B C was the occasion for the inscribing of the famous Rosetta Stone (which see) Epiphanes was poisoned by some of his court while preparing for a war to regain lost territory

Ptolemy XII, surnamed DIONYSUS (about 61-47 B C), came to a kingship already under a Roman protectorate, and when he quarreled with his sister-wife, the famous Cleopatra, and drove her from the country, Caesar interfered and deposed him Ptolemy attempted to assert his rights, but was defeated, and was drowned while endeavoring to escape See CLEOPATRA, for subsequent events

PTOLEMY (CLAUDIUS PTOLEMAEUS), a famous astronomer and geographer of antiquity, whose remarkable theory that the earth is the center of the universe was generally accepted throughout Europe until disproved by the arguments of Copernicus and the astronomers who followed him. Information concerning the life of Ptolemy is meager, but it is known that he was a native of Egypt and that he belonged to that group of scholars which flourished in Alexandria about A.D. 139.

His system of astronomy, which has been named the *Ptolemaic system*, is set forth in the *Almagest*, a ponderous work of thirteen books. This theory views the earth as a globe, around which revolves the hollow sphere of the heavens, and which, compared with the heavens, is but as the point of a pin in size. Around the earth revolve the moon and sun, but in circles, of which the earth is not the center. Seven planets, arranged according to distance from the earth, are named the Moon, Mercury, Venus, the Sun, Mars, Jupiter, Saturn. To Ptolemy the world owes the invention of the theory of planets and the discovery of the inequality of the moon's motion in its orbit. He was also the only authority of his age on the subject of ancient astronomy.

As a geographer, Ptolemy improved and corrected the works of a predecessor, Marinus of Tyre. His *Geography* consists chiefly of a catalog of places, with their latitude and longitude, together with certain meager descriptive matter. This work was illustrated by a series of twenty-six maps, and a map of the world. The *Geography* was a standard textbook until the great maritime discoveries of the fifteenth century, which thoroughly revolutionized all preconceived theories on the subject.

Ptolemy studied mathematics as a tool for astronomy, and became a celebrated mathematician. He followed the idea of his predecessor Hipparchus, to whom he gives full credit in his writings. The foundations of trigonometry, plane and spherical, created by Hipparchus, and explained and published by Ptolemy, formed a contribution to pure mathematics which remained unsurpassed many years after the Ptolemaic system of astronomy was discredited. B.M.W.

PTOMAINES, *toh' may inz* (commonly, *toh' maynz*), are a class of alkaloids formed by the decay of animal tissue, or produced in living bodies by putrefactive bacterial action upon organic matter. The presence of ptomaines in food that has spoiled causes a serious form of food poisoning. The symptoms of this poisoning are chilliness, headache, dizziness, pains in the abdomen, and vomiting and purging. Convulsions and coma often occur in cases that end fatally. Treatment consists in cleaning out the stomach and bowels and administering stimulants. All cases should have the care of a physician.

Formerly, most cases of severe food poisoning were ascribed to ptomaines, but it is now known that various specific bacteria are responsible for many attacks of this nature. Botulism, a form of poisoning that is usually fatal, is caused by the bacillus botulinus, which is often found in canned food not properly sterilized. See ALKALOIDS; FOOD PRODUCTS, PRESERVATION OF. T.B.J.

PTOSIS, *toh' sis*. See BLOOD PRESSURE.

PTYALIN, *ti' a lin*. See PEPSIN; SALIVA.

PUBIS. See SKELETON.

PUBLIC ACCOUNTANT. See ACCOUNTANCY.

PUBLIC DEFENDER. It frequently happens that a man who is accused of an offense does not have money to employ a lawyer to defend him. In such event, in nearly all courts, the judge will call upon some one to plead his case, without expense to him. But the man selected is frequently an inexperienced or unsuccessful lawyer, or is too busy to give the case proper attention; while against the defendant would be the prosecuting attorney, a man given his office for ability, and eager to make a good record. The result would scarcely be justice, or a fair working of the principle that a man is innocent till he is proved guilty.

It was reasoning of this nature which prompted Los Angeles County, Calif., to appoint in January, 1914, a public defender, paid

by the state, to insure fair treatment to penniless prisoners. In addition to the duty above outlined, this official is given the tasks of helping working people collect wages, and of representing citizens in small lawsuits for which they cannot afford regular counsel; in this capacity, he merely takes the place of legal-aid societies and other charities.

The Los Angeles experiment has not been widely copied, though it is claimed that it is successful, even to the point of saving money for the state by saving time for the court. Portland, Ore., has a public defender for the police court.

PUBLIC HEALTH SERVICE. See HYGIENE (Public Hygiene).

PUBLIC LANDS. See LANDS, PUBLIC.

PUBLIC ROADS, BUREAU OF. See AGRICULTURE, UNITED STATES DEPARTMENT OF.

PUBLIC UTILITIES, a name applied to all enterprises which directly serve the local needs of a community, such as railroads, telegraph, telephone, waterworks, electric light, gas, etc.

PUBLIC SPEAKING. This art has a wide application in modern life. Notwithstanding the vast increase in the printed matter which surrounds and almost submerges the average man, the spoken word is still a vital factor in his everyday life. What would political campaigns, or school commencements, or conventions, or congresses be without speeches? Every kind of human interest has its organization which is carried on by virtue of the readiness of its members to speak up in support of their convictions and aspirations.

The invention of radio has further emphasized the importance of speeches and speech-making. Aside from its entertainment value, radio makes possible the wide dissemination of useful information on many subjects. It enables the public official to discuss public questions, the traveler to recount his experiences in distant lands, the scientist to report on the most recent discoveries, and the head of a government to discuss important matters directly with the people. The widespread use of radio is giving to this subject an importance it has never before possessed.

The principal function of public speaking, which distinguishes it from other forms of communication, is that of persuading one's hearers or convincing them of some truth. Its object is not only to inform the auditor, but to influence his decision; not only to state facts, but to marshal them to a conclusion. Hence, a worth-while speech will be addressed to the feelings, as well as to the reason, of the hearer.

It often happens that a person who is not an experienced speaker is invited to give a talk, and although he would like to accept the invitation, the thought of preparing a speech and facing an audience may cause him to decline. The following suggestions are presented for the purpose of giving practical help to the novice, and assisting him to acquit himself with credit.

First of all, it may be said for his encouragement that the average audience is tolerant and sympathetic. It is inclined to appreciate the speaker's effort, and is usually ready to meet him more than halfway. If he does his best, he will probably meet with a cordial response. In other words, his difficulties are largely with himself, rather than with his hearers.

A good deal depends upon a wise choice of a subject. An essential characteristic of a good subject is that it is neither too broad nor too abstract. For example, "Agriculture" is too big a topic to be treated in a single address; but one could discuss, "What I Know about Poultry-Raising," or "The Products and By-Products of Corn," without great difficulty. The objection to abstract subjects is that they are too vague. It would be hard to say anything very new or interesting on a subject like "Duty," for instance; but if it be made specific, as, "The Duty of Every Citizen to Vote," the topic is at once brought within the compass of even a brief, informal address.

The next consideration is to find a way to begin, a handle by which to lay hold of the subject. The simplest and most effective method is to put oneself in the place of one's hearers and decide the questions which would naturally occur to them. The speaker should ask himself, "What should I like to know about this subject if someone else were speaking on it?" If he can put himself in the hearer's place, the speaker can easily ask the questions that the speech ought to answer. This questioning attitude supplies in effect a means of analyzing the subject into its component parts. It will result in a simple outline of the things that should be said in order to satisfy the hearer.

For example, suppose that an address is to be given on the subject, "The Work of the Weather Bureau." What should I like to know about it? These are some of the questions that anyone would ask: "What kinds of service does the Weather Bureau perform?" "How and where are observations made?" "How are predictions based on the observations?" "Are predictions accurate?" "How far in advance can the weather be predicted?" "What were some instances of practical benefit resulting from weather prediction?" "How much does the service cost the nation?" "Whom does the service particularly benefit? the farmer? the shipper? the aviator?"

If we change these questions into topics, grouping together those that pertain to the same doings, an outline like the following will result:

THE WORK OF THE WEATHER BUREAU
1. Divisions of the service
2. Observations
   a. Kind
   b. Number
   c. Distribution
3. Predictions
   a. How made
   b. Accuracy
   c. Time element
4. Historic examples
5. Cost of service

If a more detailed treatment is desired, additional questions can be listed and afterward changed to topics in the same way. Each of the main topics can be further subdivided, by asking questions about it just as about the original subject. Because one can always ask questions, this method gives a general plan of attacking any subject. One advantage of the plan is that a subject can be outlined, even though little is known about it beforehand. The plan can also be used to advantage in the writing of compositions and themes. After working out the outline, the next step is to obtain the information needed, and to write it out in as clear and pleasing a way as possible. The usual sources of information are the public library, and the daily press, magazines, and trade journals, and one's own experience.

One point that will have to be decided early is whether to read a manuscript, speak from notes, or rely entirely on one's memory. Each of these ways has its advantages and disadvantages, and the speaker will have to be guided largely by his own preference. A manuscript has the advantage of being definite, and its use requires no apology. It is a situation analogous to that of the Scottish hunter who said that he disliked to shoot from a rest, but it was better than missing the mark A manuscript is an evidence of thoughtful preparation, and is, in fact, an implied compliment to the audience. It also has the advantage of a positive stopping point—a valuable feature for both speaker and audience.

The importance of a well-rounded conclusion can hardly be overemphasized. It is proof that the speaker has reached his objective. It may consist of a summary of the points made, or emphasis on the most important point, or a deduction from all that has preceded. In any case, it must give a sense of completeness, a feeling that speaker and audience have traveled a certain road together, and have finally arrived somewhere. An effective conclusion will necessarily be based on the nature of the speech, but it is an indispensable factor in any well-ordered address.

When a speech has been prepared as carefully as one's time will permit, the next consideration is its delivery. Probably the first test of the speaker's mettle will be his response to the introductory remarks of the chairman or presiding officer. Most introductions are complimentary to the speaker—some of them embarrassingly so; some are so awkwardly phrased that they unintentionally put the speaker in a false light; and some are so long drawn out that the speaker is robbed of his rightful time. Hence he must be prepared to face any situation that may arise, and make the best of it. His acknowledgment should be modest and friendly, and should at once put him on good terms with his audience. However, the introduction and response should be brief, and should not encroach on the speech itself.

The next important thing for a speaker to remember is to make it possible for everyone in the audience to hear him. Probably more speeches are robbed of their proper effect because they cannot be heard distinctly, than from all other causes together. A good aid to distinct hearing is the directing of one's remarks to the people seated in the back rows—if they can hear, no one else will have any trouble. It is necessary to speak deliberately, to allow time for the sound to reach the remotest parts of the room. A conversational tone is best, but it should be louder than that used in ordinary conversation.

Experienced speakers have found that it is best to remain in one place on the platform, and to direct the voice continuously in the same general direction. Moving about or turning first to one section of the audience and then to another causes such a variation in the tones that the difficulty of hearing is greatly increased. If the speaker will maintain a uniform direction of speaking, the listeners will adjust themselves to the condition, and their chances of hearing will be the best.

The speaker's manner should be earnest and courteous. Sincerity should be the keynote of his entire effort. The hearers should feel that the speaker is giving them his best, and that he is trying to show the reasonableness of what he is advocating.

Finally, a speaker must know when to stop. A witty observer has said that the whole philosophy of public speaking is contained in the formula, "Stand up, speak up, shut up." No doubt, the last of these injunctions is violated more frequently than it is observed. However, help toward brevity and conciseness is appearing. The practice followed by the radio station of running its programs on an exact schedule is actually resulting in ten- or fifteen-minute speeches that are made within their time limits. The tonic effect of this practice will undoubtedly be felt throughout the entire realm of public speaking.

In this field, as in that of any art, practice alone makes perfect. It may be discouraging to be told that the best way to learn to speak



Photo Keystone

AS IN ANCIENT DAYS

Pueblo of the Indians of the Southwestern United States. (See next page.)

is to speak, but it is as true in this case as in all others involving skill. Of one thing the amateur speaker may be sure: he will not fail grievously if he observes these three injunctions: prepare thoroughly, speak earnestly, and quit promptly. In that event, even though the speech be not a gem of wit and learning, the speaker will be voted a person of discriminating taste and sound judgment. E.U.G.

PUBLIUS CLODIUS. See CICERO.

PUCCINI, *poot che' ne,* GIACOMO (1858-1924), a composer of modern Italian opera, noted for the beauty of his melodies and his rich orchestral effects. He was born at Lucca, of a family which in over 150 years produced a number of notable musicians. While Puccini was a student at the Milan Conservatory, he heard his first orchestral work played at the school. His first ambitious composition, the opera *Le Villi,* brought him immediate recognition, but his next effort, *Edgar,* produced in 1889, was a failure because of a poor libretto. In 1893 his *Manon Lescaut* was produced and won immediate success, and *La Bohème,* which followed in 1896, was considered a still greater triumph. *La Tosca, Madame Butterfly* (his masterpiece), and *The Girl of the Golden West,* produced between 1900 and 1910, showed fresh aspects of Puccini's genius [for the stories of these operas, see OPERA (Some of the Famous Operas)]. In 1926, many months after his death, Puccini's last opera, *Turandot,* was sung for



Photo: Wide World

GIACOMO PUCCINI

the first time, in Milan, Italy. The composer was accorded a state funeral.

PUCCOON, *puk koon'*. See BLOODROOT.

PUCK, in English folklore, a mischievous sprite or elf, sometimes known as *Robin Goodfellow*. While he sometimes tormented people in a spirit of fun, he was seldom malicious, and did favors for those who were good to him, or who gave him presents. Puck is a prominent figure in Shakespeare's *Midsummer Night's Dream*. A prominent humorous weekly published in the United States was named for him.

PUDDING, *pood' ing,* **STONE.** See CONGLOMERATE.

PUEBLA, *pwa' blah*. See MEXICO (Principal Cities).

PUEBLO, the Spanish word for *village*, was applied by early Spanish explorers to those tribes of Indians in the Southwest who lived in communities of adobe or stone houses. The fact that these Indians built permanent dwellings set them apart, in the minds of the explorers, from the less advanced tribes of that region. There are hundreds of ruins of pueblos in Southwestern United States, between Colorado and Utah and the Mexican border, and there are several occupied settlements in New Mexico and Arizona. The early Pueblos built their villages on the sides or the tops of steep cliffs which could be reached only by narrow pathways, thus securing their homes from hostile attacks. See illustration, page 5874

PUEBLO, *pweb' lo*, COLO. See COLORADO (back of map).

PUEBLO INDIANS. See INDIANS, AMERICAN (Families or Confederacies).

PUERTO PRINCIPE, CUBA. See CUBA.

PUFF ADDER. See ADDER.

PUFFBALL, any one of a group of mushrooms producing a spheroidal fruit body with spores completely enclosed. Many species have a white flesh, and these forms are edible until the flesh begins to discolor or become corky. As the puffballs mature, the interior differentiates into a mass of powdery spores, yellowish, olivaceous, or purplish. Sometimes the fruit breaks open irregularly; again, there is a gradual disintegration; or, more elaborately, there is developed an opening or crater in the top, through which puffs of "smoke" may be emitted, especially when the fruit is touched or compressed. This "smoke" consists, of course, of clouds of tiny spores. Puffballs may be found that vary from half an inch to two feet in diameter. Some of the important genera are *Calvatia*, *Bovista*, and *Lycoperdon*. See MUSHROOMS.

B.M.D.



PUG DOG

PUFFIN, *puf' in,* OR **SEA PARROT,** an odd-looking bird found in the Arctic Waters of both hemispheres, related to the auks. In winter it comes as far south as Long Island. It has a stocky body, a large head, and a remarkable, high, flattened bill. During the breeding season, certain appendages form on the beak of the male, which are molted in the fall. The breast and under parts of the bird are white, the wings, tail, and forepart of the neck blackish, and the sides of the head and throat white. The puffin is an expert swimmer and diver, and comes to land only in June and July, the breeding season These birds nest in large colonies on rocky coasts, one white egg being deposited in a burrow, or crevice of the rocks. D.L



THE TUFTED PUFFIN

This species is also known as the sea-parrot It has yellow, curly feathers, the large beak, developed by cracking shellfish, is orange and red in color

Scientific Name. Puffins belong to the family *Alcidae*. The species described above is *Fratercula arctica* There are several other species

PUG, a small house dog with a thick body, short, wrinkled, black nose, deeply wrinkled face, short, smooth, fawn-colored hair, and tail curled firmly over the back. The pug is a lazy, sluggish dog, and as its chief business is that of being a pet, it usually becomes fat on account of inactivity. Though fawn-colored pugs are most commonly seen, black dogs of this breed are also found. See DOG. M.J.H.

PUGET, PIERRE, a French sculptor of note. See SCULPTURE (France).

PUGET, *pu' jet*, SOUND, a large, irregular inlet in the northwest corner of the state of Washington. It is of great commercial importance, for the water ranges in depth from 180 to 925 feet and is free from shoals; thus the largest ships afloat can steam into all parts of it. On its shores are located Seattle, Tacoma, Olympia, Everett, and other ports, some as far as fifty to seventy-five miles from the Pacific. At Bremerton, across the Sound from Seattle, is a United States naval station. There is ferry connection between the two places, and regular steamship traffic between Seattle and Vancouver, B. C. Puget Sound is one of the most picturesque bodies of water in the United States. Its shores for the most part are high and wooded, and their water reflections add to the beauty of the locality.

Connecting Puget Sound with the open sea is the Strait of Juan de Fuca. From the junction of this strait and the Strait of Georgia, Puget Sound extends southward for about thirty-five miles before it divides into two main branches, Admiralty Inlet on the east, and Hood Canal on the west. Port Townsend is situated at the mouth of the Sound, but most of the larger cities are on Admiralty Inlet. Olympia, the state capital, is at the southernmost point of the Sound. The Lake Washington Canal extends from the Sound to Lake Washington, at Seattle. The area of Puget Sound is about 2,000 square miles.

The Sound is noted for the fisheries along its shores. Salmon-packing and canning are among the most important industries of the region, and large quantities of halibut and cod from the Alaska fisheries are brought to the Sound ports for canning. The shores were once densely forested, and many sections are still covered with fine timber, including the Douglas fir, but lumbering has greatly reduced the stand. See JUAN DE FUCA, STRAIT OF.

PUISNE, *pu' nih*, a legal term used in Great Britain and various British lands to designate associate judges or justices. The term is derived from the old French, and means *junior*. It is used at present to distinguish an associate judge from the chief justice. In Great Britain the designation is restricted to certain courts, but in Canada it is in general use for all courts. See CANADA (The Dominion Government: Supreme Court).

PULASKI, *pu las' kih*, CASIMIR (1748-1779), a Polish soldier who rendered valiant service to the Americans in the Revolutionary War. After serving in the Polish army, he joined his father and brothers in the heroic movement to liberate his country from Russian power. Accused unjustly of attempting to capture King Stanislas at Warsaw, he was exiled and his estate was confiscated. Upon going to France, escaping by way of Turkey, he met Benjamin Franklin, and was prevailed on to aid the Americans in the War of Independence.

Pulaski joined the American army in Philadelphia as a volunteer in 1777, and after distinguishing himself in the Battle of the Brandywine, was promoted to the rank of brigadier general. Then he joined the main army at Valley Forge, was commissioned to organize an independent corps of calvary, which was named Pulaski's Legion, and was sent to South Carolina. He was fatally wounded in the siege of Savannah, where he commanded the French and American cavalry.

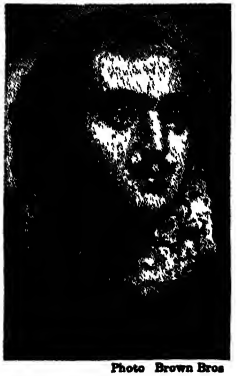


Photo Brown Bros

COUNT PULASKI

PULCHERIA, *pul kehr' ih ah*, sister of a Byzantine emperor, but real ruler of the state. See BYZANTINE EMPIRE.

PULITZER, *pu' lit zur*, JOSEPH (1847-1911), one of the greatest American journalists, born at Budapest, Hungary. His father was a Jew, and his mother a Roman Catholic. He received but little schooling, and at the age of seventeen emigrated to America, where he immediately entered the Union army, in the War of Secession. After peace was declared, he worked as a fireman on a Mississippi steamboat for nearly two years. Toward the close of 1868, the young man secured a position as reporter for a German newspaper in Saint Louis, within four years was managing editor and part owner, and became such a powerful leader among German voters that he was influential in nominating Horace Greeley for the Presidency, in 1872. Three years later, however, Pulitzer became a Democrat and sold his share in the Saint Louis paper, which was a Republican organ. In 1876 he supported Tilden for President, and made numerous speeches in German, to offset the influence of Carl Schurz, who favored Hayes. In 1877 he acted as special correspondent in Europe for the New York *Sun*, and displayed remarkable mastery of a language which twelve years earlier he could not speak.



Photo: U & U

JOSEPH PULITZER

In 1879, having bought the Saint Louis *Dispatch* and *Evening Post*, he united them under the title of *Post-Dispatch*, and within four years made a fortune from the venture. When Pulitzer bought the New York *World* from Jay Gould, in 1883, it was considered an ill-advised purchase, but his genius at once forced the paper into a leading position. He was elected to Congress from New York in 1885, but disliked the work and resigned within three months.

In 1887 Pulitzer's eyesight began to fail, and within two years he was totally blind. In this condition, he continued his editorial and other activities until within a few hours of his death. In his years of affliction, he sailed all over the world, attended by a number of secretaries, and kept in daily touch with his business in New York City. His life is an admirable example of the height to which a poor and ignorant emigrant may rise. At the time of his death, he was not only one of the richest but one of the most cultured publishers in the world, interested in literature, music, and art. Among his principal bequests were $1,000,000 to the Columbia School of Journalism, which he had founded in 1903 with a gift of the same amount; $500,000 to the New York Philharmonic Society; and an equal sum to the Metropolitan Museum of Art. See PULITZER PRIZES, below.

PULITZER PRIZES. In 1903 Joseph Pulitzer (which see) applied $1,000,000 to the endowment of a School of Journalism in Columbia University, New York City, and stipulated that it should not be opened until after his death. In his will he gave a like sum to the School of Journalism, and $250,000 to endow a Pulitzer Scholarship Fund.

Prizes are awarded yearly by the school, in accordance with provisions in the will of Pulitzer, if occasion warrants, for outstanding accomplishments in journalism and general literature, and in music and art. They cover these special fields:

1. For the most disinterested and meritorious public service rendered by an American newspaper during the year, $500.

2. For the best example of a reporter's work, the test being strict accuracy, terseness, the accomplishment of some public good commanding public attention and respect, $1,000

3. For the American novel published during the year which shall best present the wholesome atmosphere of American life and the highest standard of American manners and manhood, $1,000.

4. For the best book of the year upon the history of the United States, $2,000.

5. For the best American biography teaching patriotic and unselfish services to the people, excluding as too obvious the names of Washington and Lincoln, $1,000.

6. For the original American play, performed in New York City, which shall best represent the educational value and power of the stage in raising the standard of good morals, good taste, and good manners, $1,000.

7. For the best editorial article written during the year, the test of excellence being clearness of style, moral purpose, sound reasoning, and power to influence public opinion in the right direction, $500.

8. For the best cartoon published in any American newspaper during the year, the determining qualities being that the cartoon shall embody an idea made clearly apparent, shall show good drawing and striking pictorial effect, and shall be helpful to some commendable cause of public importance, $500.

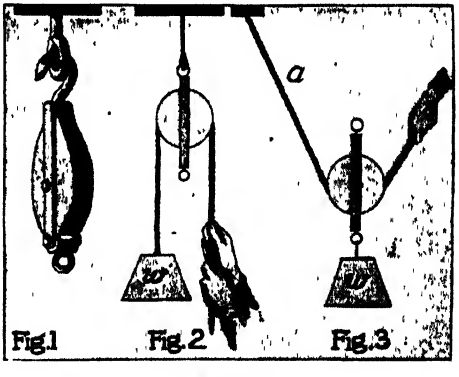
9. For the best book of verse by an American author, $1,000.

10. Three traveling scholarships, having the value of $1,500 each, to graduates of the School of Journalism, to enable each to spend a year in Europe for study

11 An annual scholarship, having the value of $1,500, to the student of music in America who may be deemed the most talented and deserving, in order that he or she may continue study with the advantage of European instruction.

12 An annual scholarship, having the value of $1,500, to an art student in America who shall be certified as the most promising and deserving by the National Academy of Design.

PULLEY, a small wheel turning on an axle, and usually with its circumference grooved to hold a rope. It is a form of simple machine, because it is a mechanical contrivance which



THE PULLEY

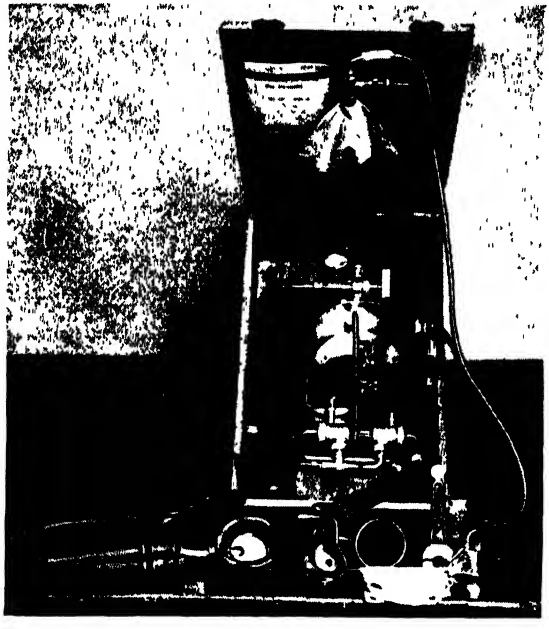
Fig 1, a simple pulley; Fig. 2, a fixed pulley, which merely changes the direction of the power; Fig. 3, a movable pulley, which increases the effectiveness of the power.

will do work. There are two forms, the fixed pulley and the movable pulley.

Fixed Pulley. As every one knows, it is easier for a person to pull downward than upward, because, in the former case, his weight is added to the strength of the muscles. So if one wishes to lift a heavy weight, it is sometimes convenient to attach a rope to it, throw the rope over a beam, and pull downward. But the friction of the rope against the beam takes away very much, if not all, of the advantage thus gained. If the beam would turn as the rope passes over it, practically all friction

would be avoided. This is exactly the principle of the fixed pulley—one whose axle is fastened to an immovable object. It merely changes the direction of a pull.

Movable Pulley. If the pulley is fastened to the object to be moved, a *mechanical advantage* may be gained; that is, the force needed to raise the object is less than its weight In Fig. 3 the weight of the object *w* is supported half by the end of the rope *a*, and half by the end of the rope which is held in the hand. Therefore, any pull by the hand in excess of half the weights of the object and the pulley will lift the weight. The mechanical advantage in this case is said to be *two*, because the weight is twice the effort needed to hold it. The article BLOCK AND TACKLE describes movable pulleys which have a much larger mechanical advantage. See MECHANICAL POWERS. A.L F.



THE PULMOTOR

PULLMAN, GEORGE MORTIMER (1831-1897), an American inventor and capitalist, remembered chiefly for the sleeping car that bears his name. He was born in Chautauqua County, N. Y. In his youth, he learned the cabinetmaker's trade, but in 1853 gave up this work to undertake a large contract for removing buildings that interfered with the widening of the Erie Canal. In 1859 he went to Chicago, and there built from two ordinary railway coaches the first models of a sleeping car. Pullman borrowed the idea from a Mr. Woodruff of Pittsburgh, who had invented a form of sleeping car about two years earlier. The scheme did not meet with public favor at first, and it was not until 1863 that the invention, now universal in America, was accepted by the railroads. See illustrations, page 5981.



Photo Brown Bros

GEORGE M PULLMAN

Four years later, Pullman organized and became president of the Pullman Palace Car Company, this enterprise became the largest of its kind in the world, and from it was realized a great fortune. As a man of practical philanthropic turn, Pullman in 1880 planned and built for his employees the model town of Pullman, Ill , with handsome houses, wide streets, and modern conveniences. The courts later declared it unlawful for the business corporation to own the town it had built, and the place was given a village charter. In 1889 it became a part of the city of Chicago

PULMONARY ARTERY. See HEART

PULMONARY CIRCULATION. See BLOOD (Circulation of the Blood).

PULMONARY PLEURA. See PLEURA

PULMONARY TUBERCULOSIS. See TUBERCULOSIS.

PULMONARY VEIN. See BLOOD, colored chart.

PULMOTOR, *pul' mo tur*, a device for inducing artificial respiration, used in cases of electric shock, gas poisoning, and drowning. It consists primarily of a tank of compressed oxygen connected with an injector, by means of which oxygen diluted with air is conveyed to the lungs of the patient In the original type of instrument, an ingenious mechanical device operates a valve in such a way that air is blown to or sucked from a mask fastened over the patient's face. An improved model has a switch worked by hand, instead of the automatic device It is claimed that the latter instrument provides a more natural method of respiration.

A committee of medical experts, acting at the request of the Bureau of Mines, reported in favor of manual methods in reviving persons overcome by mine gases. If artificial respiration is not begun within ten minutes after the

subject has stopped breathing, little can be done to revive him. For this reason, some manual method of resuscitation should always be attempted, for it is fatal to wait any length of time for a device to be brought. A standard manual method of inducing respiration is described in these volumes in the article DROWNING.

PULP WOOD. See LUMBER; PAPER.

PULQUE, *pool' kay,* an alcoholic drink, generally considered the national beverage of Mexico, Central America, and South America. It is made by fermenting the juice of the agave, or century plant, for about ten days, and then mixing with it a small quantity of fresh juice. This causes a rapid, violent fermentation, and the pulque is ready for use in about forty-eight hours. The drink has a heavy taste, somewhat resembling sour milk, and, while not pleasant to foreigners, is greatly relished by the natives It is very cooling and somewhat nutritious, but if taken in large quantities, causes excessive intoxication. See YEAST, BACTERIA AND BACTERIOLOGY, CENTURY PLANT.

PULSE, THE, a regular throbbing in the arteries, felt as a distinct beat in the radial artery at the wrist, or in the temporal artery, and occurring a fraction of a second after each heart beat With each contraction of the heart, a wave of blood is poured into the aorta, the great artery which carries blood from the heart The aorta is already filled with blood, and the wave forced into it by each contraction of the ventricle causes its walls to expand. Being elastic, they then contract, and force the blood into the arteries branching from the aorta, where the same process is repeated. Thus a series of expansions and contractions travels along the entire arterial system. The pulse is felt easily at the wrist and temples because the arteries there are near the surface. Doctors feel the pulse of a sick person, for they know that, if it beats too fast or too slow, there is some irregularity of the heart's action. Also, a pulse that is too strong or one that is too weak is of great significance in certain diseases. The pulse of a healthy adult beats on an average seventy-two times a minute. It is more rapid in children than in adults, and slower in old age than in middle life. K.A.E.

Rates at Various Ages. The average pulse rate of persons in a state of health is as follows:

At birth	130-140
During first year	115-130
During second year	100-115
During third year	90-100
About seventh year	85-90
About fourteenth year	80-85
In middle life	70-75
Old age	50-65

The pulse of an adult rarely exceeds 150 per minute; when it runs as high as 170 it portends a fatal issue.

Related Subjects. The reader is referred in these volumes to the following articles:

Arteries Blood Heart Veins

PULSE FAMILY, in botany. See LEGUMINOUS PLANTS; also, illustration in the article BOTANY.

PULTOWA, *pul toh' wah,* BATTLE OF. See CHARLES (XII, Sweden); FIFTEEN DECISIVE BATTLES.

PUMA, *pu' mah,* OR **COUGAR,** *koo' gahr,* a wild animal of the cat family, once found in the Americas from Canada to the southern part of South America. With advancing civilization, it has become extinct in large areas of



Photo Visual Education Service

A CAPTIVE PUMA

The snarling animal displays his feline jaws and teeth

its range, but is still found in the American Rocky Mountains, where it preys on sheep, calves, and other ranch animals. In that part of the country, the puma is called *mountain lion,* a name originating in the East, where early settlers mistook the animal for the female lion. It is also known as *panther* (which see), a name applied to several other members of the cat family. *Cougar* is the native South American name.

The coat of the adult puma is tawny, the hairs being fawn-gray tipped with red. It has no spots, in this respect differing from the jaguar (which see); the throat, insides of the legs, and the belly are white, and the tip of the tail black. The young are born with dusky-brown spots and with ring marks on the tail, but these markings disappear in about six months. A full-grown animal is four or five feet long, exclusive of the tail, which measures about two feet in length. The body is slender,

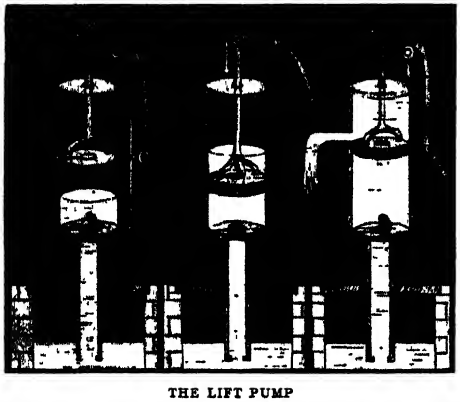
the legs long, and the head round and rather small.

Though many stories are told of the treachery of the puma, and of its habit of springing on passers-by from trees, in reality it seems to be less ferocious than other wild cats and to be reluctant to attack man. Ranchers regard it as a pest because, in attacking a sheepfold, it is not content with killing one sheep, but must make away with a hundred or more. M.J.H.

Scientific Name. The puma belongs to the family *Felidae*. It is known as *Felis concolor*.

[For illustration of the members of this family, see the article CAT.]

PUMICE, *pum' is*, a porous rock formed by the cooling and hardening of lava which contained dissolved gases. The pores in it were caused by the expansion of numerous bubbles of vapor. Pumice is so light that it floats on water, not because the rock substance is any lighter than any other natural glass (obsidian), but because it contains so many closed air chambers. It is said that, after the explosion of the volcano of Krakatoa, sailors walked two miles upon floating pumice from their ships to shore. Pumice is sometimes called *rock froth*. As it is made up of fine particles of glass, it is valued as a scouring, scrubbing, and polishing material, in both lump and powdered form. Lump pumice is the familiar pumice stone. See LAVA; IGNEOUS ROCKS. A.J.

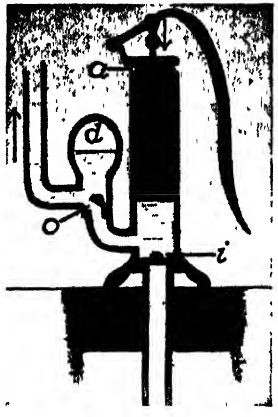


THE LIFT PUMP

In the figure, *c* is the cylinder; *p*, the piston, *s*, the intake valve; *o*, the outlet valve. In the first position, the piston is being raised The outlet valve is air-tight, and all the air is being forced out through the spout. The pressure of the water raises the intake valve, and water takes the place of the air removed. In the second position, the piston is being lowered through the water which has entered. The pressure now opens the outlet valve and closes the intake valve, preventing the return of the water to the cistern below. In the last position, the water is being forced out as the air was in the first instance, and more water is entering.

PUMP, a mechanical device for moving liquids or gases. Not all pumps operate according to the same principle. The suction, or lift, pump, the centrifugal pump, and the turbine pump all depend upon different laws; the force pump is a suction pump with an additional feature.

The Lift Pump. This is the common kitchen or well pump, so indispensable in rural communities. Before Galileo's time, scholars thought that the suction of such a pump was due to nature's refusal to permit a vacuum, but Galileo, late in the sixteenth century, noticed that the pump would not raise water much more than thirty feet, and correctly attributed its workings to the fact that air has weight If in the pump shown in the illustration, the cylinder and the pipe leading to it from below were emptied of air, there would be no pressure on the water under the mouth of the pipe. But air would still be exerting weight on the water around it, and since pressure on a liquid is transmitted through it in all directions, water would be pressed upward into the pipe. That the pump is so constructed as to take advantage of this law is shown in the illustration. The labor which the pumper performs merely lifts the water to the spout after nature has raised it to the intake valve.



THE FORCE PUMP

In the figure, *d* is the air dome; *o*, the outlet valve; *i*, the intake valve; *a*, the air valve. The pump empties the cylinder of air in the same fashion as the lift pump, but on the return stroke the water, instead of being admitted through a valve in the piston, is forced through an opening at the side and past the outlet valve The air dome serves to maintain the flow between the pressure strokes. When the water is being forced through the outlet valve, it compresses the air in the dome, as soon as the piston starts to withdraw, the outlet valve closes and the compressed air expands, driving more water into the outlet pipe

Sometimes a pump refuses to work until it has had water poured into it. The valves are not air-tight unless they are wet.

The Force Pump. The intake valve of a suction pump can never be more than thirty-three feet above the water in the cistern (see BAROMETER), and because of the imperfect valves of most pumps, this limit is reduced in practice to about twenty-seven feet. But above the intake valve, the water is raised by the force exerted on the piston, so if the spout is turned upward, the only limit to the height lies in this force.

The principle of the force pump is therefore the same as that of the lift pump, but another law of physics is commonly utilized to gain smoothness in operation. This is the law that compressed air always seeks to expand. How this helps to give a constant flow is shown in the second illustration.

Centrifugal and Turbine Pumps. When you swing a bucket of water around your head, the water does not spill out, for it is pressed toward the bottom of the pail by centrifugal force, the same force which makes mud fly from a rapidly turning wagon wheel. If a number of bottomless pails were whirled around inside a pipe, and there were only one hole where water could leave the pipe, each pail, as it passed this hole, would throw some of its water out and suck up more at the center. This is exactly the action of a centrifugal pump, though, instead of pails, there are ordinarily four blades. This type of pump has the merit of giving constant flow, but it will not lift water very high.



I don't know how to tell it—but ef such a thing could be
As the angels wantin' boardin', and they'd call around on *me*—
I'd want to 'commodate 'em—all the whole in-durin' flock—
When the frost is on the punkin and the fodder's in the shock.

—JAMES WHITCOMB RILEY: *When the Frost Is on the Punkin.*

The turbine pump is like a many-bladed screw propeller or an electric fan. Like the centrifugal pump, it produces a constant flow. In addition, it is free from valves, which in some classes of work would be liable to become clogged with sand or other small particles.

Direct-Action Pump. In addition to the types described above, there is a direct-action pump, in which the motion of a driving member is communicated directly to a water plunger. It is usually operated by steam power, and is used for a wide variety of purposes. Among these may be mentioned the pumping of water at high pressure for extinguishing fires, drawing water from the shafts of mines, pumping oil, filling tanks, supplying water for steam boilers, and many other purposes where positive action is required.

Power Pumps are of various types. The basic principle of their operation is the movement of the water plunger by means of a crank and connecting rod. A steam engine, an electric or gasoline motor, or a water wheel may be used as the motive power. In the centrifugal type of pump, an impeller, which consists of a disk with ribs or vanes, performs the function of a plunger. This type has lately been developed to a high point of efficiency. It is used for pumping in connection with waterworks, mines, deep wells, irrigation, dredging, sewage disposal, and many other purposes.

Related Subjects. The reader is referred in these volumes to the following articles;
Air Air Pump Centrifugal Force Siphon

PUMPERNICKEL, a variety of bread made from whole, unbolted rye. It has been for centuries the chief food of peasants in some Central European countries. The taste for pumpernickel must be acquired by people not accustomed to it, for it has an acid flavor. It is a nourishing food.

PUMPKIN, a coarse, running vine with hollow stalks, broad, prickly leaves, and large, orange-colored, gourdlike fruit. The plant is believed to have been known to the native Americans and planted among their corn, in England it has been cultivated since the sixteenth century. The globe-shaped fruit, often two feet in diameter, has tough, stringy pulp and large, white seeds. It is not eaten raw, but when cooked, it makes delicious filling for pies. It is cultivated in the same manner as squash (which see). B.M.D.

Literary Reference. Whittier, in his poem *The Pumpkin,* refers to the custom of making jack-o'-lanterns from the fruits on Hallowe'en (see HALLOWE'EN), as well as to the heroine of the fairy story *Cinderella,* who went to a ball in a coach made from a pumpkin.

O,—fruit loved of boyhood!—the old days recalling,
When wood-grapes were purpling and brown nuts were falling!
When we laughed round the corn-heap, with hearts all in tune,
Our chair a broad pumpkin—our lantern the moon,
Telling tales of the fairy who travelled like steam
In a pumpkin-shell coach, with two rats for her team.

Scientific Name. The pumpkin belongs to the gourd family, *Cucurbitaceae.* Its botanical name is *Cucurbita pepo.*

PUMPKINSEED. See SUNFISH.

PUN, a play upon words having the same or similar sounds, but different meanings. An example is the question and answer, "Is life worth living? That depends upon the liver." The pun is as old as Aristophanes and Cicero, both of whom employed it. Samuel Johnson's dislike of the pun brought forth his statement that "the man who would make a pun would pick a pocket." Despite his attitude, the pun has been used more in England, perhaps, than in any other country. It is declared by purists to be the lowest form of wit.

PUNAKHA, *poo nuk' ah,* the capital of Bhutan (which see).

PUNCH AND JUDY, the two principal characters in a comic puppet show of Italian origin. The word *Punch* is a contraction of Punchinello. Punch and Judy shows were popular in England as early as the seventeenth century. The light plot represents the story of a domestic quarrel, in which a police officer intervenes, who in turn is arrested by another official. See DRAMA (Puppets and Marionettes).

PUNCTUATION, *pungk tu a' shun,* in writing and printing, is the use of certain signs to make clear the author's meaning. There are definite rules of punctuation which should always be observed. For example, the end of every declarative sentence should be indicated by a period. On the other hand, there are cases in which the procedure is not so clear. In the sentence, *The books which I have read I herewith return,* the meaning is, *I return only those which I have read.* If, however, the clause be set off by commas, as *The books, which I have read, I herewith return,* the meaning is, *Having read all, I now return them.* In this case, the punctuation is determined by the meaning, and the sentence should be punctuated accordingly. There are even optional cases, such as two independent clauses not closely connected, in which the use of a comma may be entirely a matter of individual choice.

Because of this mingled certainty and uncertainty, confusion may arise in the mind of the inexperienced writer. He may conclude that the whole subject is so indefinite as not to be worth serious consideration. This is far from the fact. The rules are definite and they are easy to learn and apply. The best course to follow is first to master the rules, and then use them to bring out one's meaning clearly. The optional instances are nearly always questions of thought, and if a writer knows the rules, his punctuation will help him to bring out his meaning with accuracy and certainty. If punctuation be regarded as a means of expression, rather than as a slavish following of rules, the writer need have little fear of the outcome. The rules will help, not hinder, him. The common marks of punctuation, with their chief uses, are given below:

Period. The period (.) is used at the end of a declarative sentence and after all abbreviations. It should be placed inside of quotation marks if the sentence employs them at the end. Use no period after Roman numerals.

Interrogation Point. The interrogation point (?) is used to mark a query, and should be placed after every sentence which is a direct question, as *Where are you going?* Indirect questions should not be followed by an interrogation point: *He asked where I was going.*

Exclamation Point. The exclamation point (!) is used to mark an emphatic utterance or an outcry, whether this is a full sentence or merely a few words: *Hello! How are the mighty fallen! Long live the king!* The use of this mark as a sign of irony, as in *He presented us to his three beautiful (!) daughters,* is not considered in good taste.

Comma. The comma (,) is the most used of all the points, because it marks the slightest interruption in the thought or in the structure of a sentence. There are more variations in its uses than in those of any other points, but the rules which follow are accepted by practically all the best authorities:

(1) A comma is used to separate the members of a series: *Roses, lilies, pansies, and marigolds grew in the garden.*

(2) To divide proper names which belong to different places or individuals: *To Europe, America used to appear a benighted continent; For Mary, Jane had not a word of reproach.*

(3) Ordinarily, to set off clauses introduced by the conjunctions *and, but, if, while, as, when, because,* and so on. This rule applies particularly to cases where the subjects change *We did the work, but you had reaped the benefits, John sprang to his feet, and Mary cried out in amazement, As I cannot see him, I shall not wait, When you meet him, give him my regards* In cases where such a clause is necessary to the meaning of another clause, the two are not separated by commas: *I would not if I could*

(4) To set off such conjunctions, adverbs, or phrases as *now, however, nevertheless, for instance, after all, of course,* and the like, when they occur at the beginning of a sentence or clause, or are so placed in the middle of a sentence or clause as to make a distinct break in the structure *Now, the gist of the matter is this; However, you persisted in your folly; Nevertheless, you will have to concede the point.*

(5) After participial phrases at the beginning of a sentence, especially if these contain an explanation of the main clause *Hearing a noise, he went to the door; Having found out the truth, we trusted him no further.*

(6) To set off phrases or clauses so placed as to cause a break in the structure of the sentence. *Since, by the doctor's advice, you are here, why not make the best of it? If, as I believe, this is true, let us act upon it*

(7) To separate two identical or very similar words, even if grammatically no such separation is necessary: *Whatever is, is right,* or to separate two numbers· *In 1911, 246 delegates were present*

(8) To indicate the omission of some word or words which must be mentally supplied if the meaning is to be clear: *Harry has six books; John, five; Mary, four.* This rule is not invariable.

By many writers commas are given additional uses, but the above are the ones in which they are required to assure clearness.

Semicolon. The semicolon (;) is used to mark a break in thought or structure greater than that shown by the comma. Sometimes two clauses which really seem like distinct sentences are separated by a semicolon, because the writer wishes to place emphasis upon the close connection of the thought. When a

number of clauses which might otherwise be separated by commas contain commas, the semicolon is used for clearness: *In October, if all goes well, we are planning a harvest festival; in November, a Thanksgiving celebration; and in December, a Christmas pageant.*

Colon. The most common use of the colon (:) is to indicate that what follows it explains what precedes it. In practice, it is seldom used except in this introductory manner, to call attention to some quotation, illustration, or example, as seen in the foregoing paragraphs.

Dash. The dash (—) is used to indicate a sudden break in sense, structure, or both· *To be or not to be—that is the question*; *Shall I—dare I—do it?* Often the phrase or clause which follows the dash is explanatory of that which precedes, as is the case in the following quotation:

> Because the good old rule
> Sufficeth them—the simple plan,
> That they should take who have the power,
> And they should keep who can

The dash should not take the place of other marks of punctuation—commas, semicolons, and even periods—as it is frequently made to do by careless writers, for a slovenly style results.

Quotation Marks. Quotation marks are punctuation symbols used before and after certain quoted expressions. They are generally used in pairs, but quotations within quotations are enclosed by single marks. The marks at the beginning of the quoted passage are inverted commas; those at the end are apostrophes, as " ".

The following are the most important rules for the use of these marks:

A direct quotation is set off by quotation marks, as: Nelson said, "England expects every man to do his duty "

Citations of a passage in the author's own words, when run into the text, are enclosed by quotation marks. Passages set off by themselves are frequently printed in different type and the quotation marks may then be omitted.

When several paragraphs are quoted and quotation marks are used, it is customary to place the symbols at the beginning of each paragraph and at the end of the last one

A word or phrase accompanied by its definition is set off by quotation marks, as· In printing, "to kill" means to destroy type Technical, unusual, slang, or coined expressions are often set off by quotation marks This is also true of nicknames, popular names of states and cities, pen names, and the like. In all of these cases, however, some authorities prefer italics

Either italics or quotation marks are used to set off names of ships, names of pictures, and titles of poems, books, lectures, sermons, periodicals, and the like.

Most authorities place the final pair of quotation marks before the semicolon when that symbol closes the quoted passage

Parentheses. Parentheses () are used to enclose words, phrases, or clauses inserted in a sentence to explain or to introduce some thought or suggestion that is really not essential to the course of the argument: *You say (I believe I caught your meaning correctly) that you will have no part in the movement.*

Figures or letters used to mark enumerations in text matter are enclosed in parentheses: *My reasons for going abroad were three*: (1) *a desire to travel*, (2) *failing health*, (3) *a promise to visit my brother in London.*

Apostrophe. An apostrophe (') is used to indicate the omission of letters or figures in contractions: *haven't, ne'er, the class of '32.* The possessive case of nouns is formed by adding an apostrophe: *man's, Scott's, Jones's farm.* The plurals of letters, figures, and certain artificial nouns are formed by the apostrophe and *s*: *two's and three's, the 1900's, the three R's.*

PUNIC, *pu' nik*, **WARS,** the name given in ancient history to three struggles between Rome and Carthage. The name Punic was given by the Romans to the Carthaginians because of their Phoenician origin. The first of these wars lasted from 264 to 241 B.C., the second from 218 to 201 B.C., and the third from 149 to 146 B.C. The Romans were victorious in all three. In the first, they gained possession of a part of Sicily which had previously belonged to Carthage; in the second, they won Spain; and in the third, they overthrew the Carthaginians and destroyed their city. By this last achievement, Rome became supreme mistress of the world.

Related Subjects. The reader is referred in these volumes to the following articles

Carthage	Regulus, Marcus
Hamilcar Barca	Rome (External Expansion)
Hannibal	Scipio

PUNISHMENT, EVERLASTING. See PREDESTINATION. For punishment of crime, see CRIME; CRIMINOLOGY.

PUNJAB, *pun' jahb*, a province in the northwestern part of British India, consisting chiefly of a vast plain sloping gradually southward from the foothills of the Himalaya Mountains. The name is the Hindu word for *five rivers*, and has reference to five streams which drain the region and pour their united waters into the Indus River. The province has a total area of about 130,000 square miles, the greater part of which is under a British governor; the remaining territory is divided into a number of native states, subject to British authority. About twenty-five million people dwell in the Punjab, chiefly Mohammedans and Hindus. They have a good educational system, including a university, and have constructed an extensive system of railways and over 250 miles of navigable canals. Lahore is the capital of the province.

Agriculture is the most important industry in the Punjab, this province having a larger area under irrigation than any other of the British divisions. This region is the most important wheat-growing section in India. Other crops of commercial value are millet, maize, barley, oil seeds, sugar cane, and cotton. The people of the Punjab are particularly noted for their hand-loom weaving. Over three-fifths of all the camels in British India are found in the Punjab, which contains large desert areas, particularly in the southern part.



LOCATION MAP

The chief executive is a governor, who is aided by four ministers; three of these are Indians. There is also a legislative council. See INDIA.

PUNT. See SAILBOAT AND SAILING; FOOTBALL.

PUNKY, an almost invisible gnat. See GNAT.

PUNTA ARENAS, *poon' tah ah ra' nahs,* former name of Magallanes. See CHILE (The Cities); also COSTA RICA (The Cities).

PUNXSUTAWNEY, *pungk soo taw' nie,* PA. See PENNSYLVANIA (back of map).

PUPA, *pu' pah,* the resting stage in the development of an insect, between the larval and the adult states. The appearance of the insect in the pupal stage varies for different species. In general, the worm, caterpillar, or grub assumes a mummy-like form, with feelers, legs, and wings closely folded on the under part of the body. Sometimes the pupa merely burrows in the ground or hides in a crevice. Caterpillars of butterflies encase themselves in a hard skin and become chrysalids (plural of *chrysalis* or *chrysalid*). The larvae of most species of moths spin silken cocoons, and the pupae lie dormant in these cases. Honeybees pupate in brood cells of honeycomb. The pupae of flies look like small, smooth, oval-shaped capsules. Those of beetles show rather distinctly the adult form of the insect. The pupae of all these insects live on the nourishment which the greedy larvae have been storing up during days or weeks of voracious feeding. W.J.S.

Related Subjects. The reader is referred in these volumes to the following articles:

Chrysalis	Insect (Developing Insect)
Cocoon	Metamorphosis

PUPARIUM. See FLY (Preventive Methods).

PUPIL, the black area in the iris of the eye (which see).

PUPPETS. See DRAMA (Puppets and Marionettes).

PURCELL, HENRY. See OPERA.

PURDUE UNIVERSITY, at Lafayette, Ind., is one of two universities supported by the state of Indiana. The other is Indiana University, at Bloomington. Purdue University is primarily an institute of technology, and is organized into schools of mechanical, civil, electrical, and chemical engineering, agriculture, science, and pharmacy. It admits women to all courses. The school was founded in 1869 under the Federal Land-Grant Act of 1862, and was named for John Purdue, who gave 100 acres of land and $150,000 as an endowment. Regular sessions were begun in 1874. Besides the university campus, there is an experimental farm. The faculty numbers about 275, and the student body, nearly 4,000. See INDIANA (Education).

PURE-FOOD LAWS are designed to protect public health by regulating the manufacture, sale, and labeling of foods and drugs In the United States, about half the states had passed laws of this character when Congress adopted the Federal Food and Drugs Act of 1906, which regulates the sale of all foods and drugs that enter into interstate or foreign commerce. Most of the remaining commonwealths have adopted state food laws since then, so that the American people are well protected against fraud and dishonesty in the purchase of food and medicine.

The Federal Food and Drugs Act went into effect on January 1, 1907, and is enforced by the Bureau of Chemistry, a division of the Federal Department of Agriculture. The Bureau maintains inspection stations in the leading ports and trade centers, and is constantly testing and analyzing foods and drugs in its laboratories. It has prosecuted thousands of persons accused of violating the law, and brought the offenders to justice. Patent medicines by the score have been driven from the market by the operation of the act.

This law regards a food as *adulterated* if it contains such substances, or is so mixed or packed, that its strength or quality is damaged; or if its composition renders it poisonous or unfit to eat The use of coloring matters or other substances that conceal the inferiority of a food is also an adulteration. A food is *misbranded* if it imitates or is offered for sale under the distinctive name of another article; or if labeled in such a way as to mislead the purchaser; or if its label bears incorrect statements of weight or measure. Similar regulations apply to drugs and confectionery. See ADULTERATION OF FOODS AND CLOTHING. E.V.M'C.



JOHN ALDEN AND PRISCILLA MULLINS

(See pages 5886, 5887.)

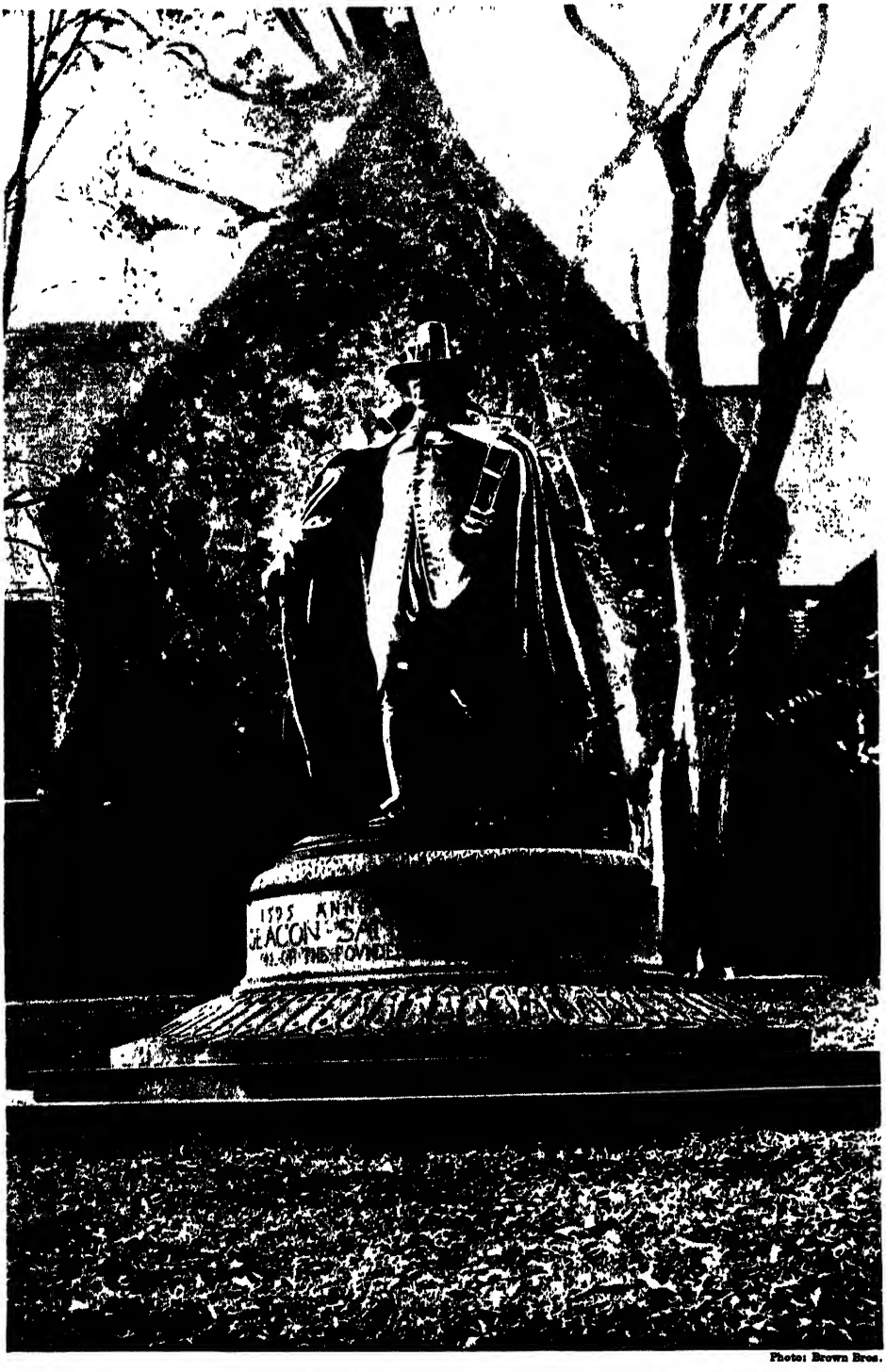


Photo: Brown Bros.

THE PURITAN DID NOT STOP TO THINK; HE RECOGNIZED GOD IN HIS SOUL, AND ACTED.—WENDELL PHILLIPS.

[The illustration is that of the famous statue, *The Puritan*, representing Deacon Chapin, a notable character of Springfield, Mass It is the work of Saint Gaudens.] See next page.

PURGATORY, according to the belief of the Roman Catholic Church, is a state in which the souls of persons dying repentant suffer the expiation of their sins before being allowed admission into heaven. It is believed that these sufferings are lessened by the offering of prayers and masses. The doctrine of purgatory was first suggested by the Church fathers in the third century, and was established by Gregory the Great in 604 as a regular dogma of the Church.

PURIM, a Jewish secular feast in honor of the deliverance of the Jewish nation from the plots of Haman. See *Esther* IX, 26.

PURISSIMA. See CALIFORNIA, list of old missions.

PURITANS. This is one of those names which, given in derision, have come to be badges of honor to those who have borne them. If the name and the work of the Puritans were omitted from English and American history, the tale would lack much of its vital, soul-stirring quality; if the traits of the Puritans were eliminated from English and American character, that character would lack many of its most admirable traits. Later centuries have given the credit for love of freedom and of Protestantism—even democracy itself—to those serious, earnest men who in their own day were looked upon as fanatics.

Even after the Church of England had broken with the Church of Rome, various factions within the Church remained dissatisfied, and a certain body of reformers, by their insistence on "purifying" the ritual and doctrines of the Church, and on accepting as authority only the "pure word of God," won for themselves the derisive title of *Puritans.* They did not wish, as did the Separatists, to leave the Church of England, but as they lost, little by little, all hope of the longed-for reforms, they gradually separated from the parent body. In time, small groups, dissatisfied with civil and religious conditions in England, and encouraged by the example of the Pilgrims, who had founded Plymouth Colony, emigrated to America and began to make settlements on the shores of Massachusetts Bay. The settlements at Boston, Charlestown, Dorchester, Roxbury, and Watertown were all Puritan enterprises (see COLONIAL LIFE IN AMERICA). It is a disappointment to the student of colonial history to learn that these seekers of religious freedom for themselves were intolerant toward others who dared to differ from their principles.

In England, the Puritans played for a time an important part in politics. The bitter struggle between Charles I and his Parliament over the question of the divine right of kings; the death of Charles I; the establishment of the Commonwealth under the leadership of Cromwell; the raising of England to a position of power and respect among the nations—all of this the Puritans brought to pass. Their political power was lost with the restoration of the Stuart dynasty in 1660, but the spirit of Puritanism at its best was a permanent force for good in England. Macaulay, none too friendly a critic, who declared that the "Puritan hated bear-baiting, not because it gave pain to the bear, but because it gave pleasure to the spectators," thus sums up their place in history:

> We would speak first of the Puritans, the most remarkable body of men, perhaps, which the world has ever produced. The odious and ridiculous parts of their character lie on the surface . . . the ostentatious simplicity of their dress, their sour aspect, their nasal twang, their stiff posture, their long graces. . . . The Puritans were men whose minds had derived a peculiar character from the daily contemplation of superior beings and eternal interests. . . . The Puritan . . . prostrated himself in the dust before his Maker; but he set his foot on the neck of his king.

See illustrations, pages 5885, 5886

Related Subjects. The following articles in these volumes may be read in this connection

Barebones Parliament	Marston Moor
Charles (I, England)	Massachusetts (History)
Commonwealth of England	Massachusetts Bay Colony
Cromwell, Oliver	Naseby, Battle of
Endicott, John	Pilgrims
Grand Remonstrance	Plymouth Colony
Hampton Court Conference	Roundheads
Long Parliament	Self-Denying Ordinance
	Winthrop, John

PURNELL ACT. See AGRICULTURAL EXPERIMENT STATIONS.

PURPLE, *pur' p'l,* a color produced by mixing red and blue pigments. Different shades are produced by varying the proportions of red and blue. Tyrian purple, which is a deep crimson, was the only purple known to the ancients. The dye was obtained from a shellfish found in the Mediterranean Sea, and called by the Romans *Purpura murex*; hence the name *purple.* Since each shellfish yielded only a small quantity of the dye, the color was very expensive. In the time of Cicero (which see), a pound of wool dyed with Tyrian purple cost $175. Because of this cost, purple was the symbol of rulers and of wealth. Jesus describes a "certain rich man which was clothed in purple and fine linen." The Roman emperor wore a purple toga, the royal decrees of the Byzantine Empire are said to have been written with purple ink, and we still use the expression "the purple" to convey the idea of rank or authority.

The Romans discovered a process for making a purple dye from a variety of lichen, and kept the process secret for more than a century. Now purple dyes are made from coal-tar products. See COLOR; DYEING AND DYESTUFFS. A.L.F.

PURPLE FLAG. See IRIS.

PURPLE GRACKLE. See CROW BLACKBIRD.

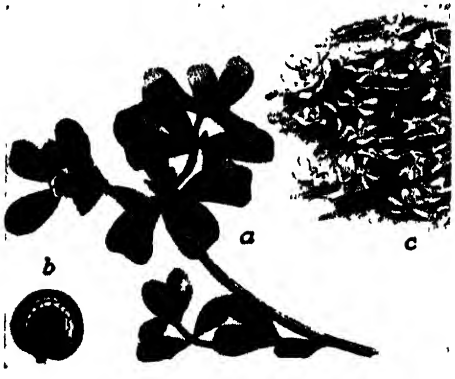
PURPLE MARTIN. See SWALLOW.

PURPURA MUREX. See PURPLE, above.

PURPURIN, *pur' pu rin.* See MADDER.

PURSHIANIN. See CASCARA SAGRADA.

PURSLANE, *purs' lane,* a trailing weed popularly known as PURSLEY or PUSLEY, that is found commonly in American gardens and cultivated fields. Besides spreading over a good deal of ground, the plant is an abiding



PURSLANE

(*a*) Stalk and leaves; (*b*) seed, highly magnified; (*c*) the weed as it appears, growing close to the ground.

place for insects that feed on corn and melons. It has thick, fleshy leaves and stems, and inconspicuous yellow flowers that open only on sunny mornings. Since the purslane bears seeds in almost countless numbers, it is important to eradicate it before the seeds mature. Some farmers graze pigs on the weed, as they are very fond of it. The young shoots of the purslane are eaten in salads and also used as greens. B.M.D.

Botany. The purslane belongs to the family *Portulacaceae.* Its botanical name is *Portulaca oleracea.* It is closely related to the garden portulaca, a flowering annual cultivated under many different forms.

PUS, a product of suppuration, a process employed by nature to throw off bacteria or noxious elements, and sometimes foreign bodies lodged in the tissues. In order to get rid of a splinter in the flesh, suppuration takes place through the production of pus, which is a thick, creamy, yellowish liquid.

PUSHKIN, *poosh' kin,* ALEXANDER (1799-1837), creator of modern Russian literature, was of aristocratic birth. Before his education in Saint Petersburg (now Leningrad) was finished, his ability as a poet had been recognized. In 1820 he published *Ruslan and Ludmila,* the first great Russian poem since the early epics.

After a few years of carefree life, Pushkin's revolutionary verses exiled him, first to Bessarabia, then to his estates in interior Russia. In these years of exile, his best work was done. Long evenings spent listening to his nurse's folk tales trained him in the simple, pure Russian language which in his works freed literature from the pompous, pseudo-classical style previously used. He came under the influence of Byron and, later, of Shakespeare.

From exile, Pushkin was called to court, where he became an official. The years from 1826 to 1837 saw the production of a great volume of work, chief of which was the novel in verse, *Eugene Onegin,* in which Russian scenes and Russians were depicted with realism for the first time in modern Russian literature. Onegin, a new type of hero, became the model for Russian novelists from the time of Pushkin to Tolstoi. During this period, Pushkin married, none too happily, and, in 1837, was killed in a duel over his wife.

Pushkin was a master of prose as well as verse. One of his most popular short stories, *The Queen of Spades,* was used by Tschaikovsky for an opera. A dramatic chronicle, *Boris Godunov,* is well known through the opera based upon it by Mussorgsky. This was the first drama in the Shakespearean style; before Pushkin, the Russian stage had been French. To Pushkin the Russians owe the creation of the Russian literary language, the change from an artificial style to the rich and expressive native Russian.

His Works. The most important volumes are *Ruslan and Ludmila,* a fairy tale in verse which the Russian composer Glinka made into a beautiful opera, *Eugene Onegin, The Gypsies, Poltava, Boris Godunov,* and *The Captain's Daughter* Pushkin also wrote many other short stories and poems.

PUSH-PULL. See RADIO COMMUNICATION (Glossary of Radio Terms).

PUSSY. For origin of this term, relating to the cat, see CAT.

PUSSY WILLOW. See CATKIN.

PUT-IN-BAY. See ERIE, LAKE; PERCH; PERRY, OLIVER HAZARD.

PUTNAM, HERBERT (1861-) known for his work as Librarian of Congress, in the Congressional Library at Washington, was born in New York City, and educated at Harvard University and Columbia Law School. From 1877 to 1891, he was librarian of the Minneapolis Public Library. He was admitted to the bar in 1892, and took up the practice of law at Boston, which he followed for three years, then became head of the Boston Public Library. In 1899 he was appointed to the post of Librarian of Congress.

PUTNAM, ISRAEL (1718-1790), an American patriot who saw active service in the colonial and Revolutionary wars. He was born in Old Salem, Mass. (the present Danvers), and



Photo: U & U

A Thrilling Incident of the Revolution. General Putnam, on his way to join the Continental army, escapes from an ambush laid for him by the British.

settled in Connecticut as a farmer and woolgrower. During the French and Indian War (1754-1763), in which he rose to the rank of major, he was captured by a band of the enemy, and was exchanged only after suffering cruel torture. Toward the close of the struggle (1762), he led a Connecticut regiment in an expedition to the West Indies. Throughout the pre-Revolutionary period, Putnam showed himself a most zealous opponent of British misrule; among other activities, he served as chairman of one of the committees of correspondence (which see).



Photo: Brown Bros.
ISRAEL PUTNAM

Putnam heard of the Battle of Lexington while working in the field, and, dropping his plow, he started at once for Cambridge and allied himself with the cause of the colonies. For four years he gave his best services to the cause of American liberty, retiring only when an attack of paralysis made him an invalid. In the Battle of Bunker Hill, he displayed conspicuous courage. Commissioned a major general by Congress, Putnam gave Washington valuable aid in the operations about New York and in New Jersey, and his last command was in the Highlands. At Hartford, Conn., there is a fine monument in his honor, the work of J. Q. A. Ward.

PUTNAM, NINA WILCOX (1888-), an American novelist and short-story writer, whose work, for the most part, portrays the humorous side of life. She was born in New Haven, Conn., was educated at home by a governess, and began to test her literary power at the age of eleven. She was married to Robert Faulkner Putnam in 1907; after his death, in 1918, she became the wife of R. J. Sanderson, whom she divorced in 1926. Mrs. Putnam's original use of slang and unconventional grammar gives her stories a distinctive quality of fun and good cheer.

Leading Works. The most popular of her books include *The Little Missioner, In Search of Arcady, Orthodoxy, Adam's Garden, When the Highbrow Joined the Outfit, Esmeralda, Sunny Bunny, Believe You Me, It Pays to Smile, West Broadway, Laughter Ltd., Say It with Bricks,* and *Easy.* A humorous series of sketches, *I and George,* was syndicated to the newspapers.

PUTNAM, RUFUS. See OHIO COMPANY.

PUTREFACTION, *pu tre fak' shun,* the decomposition into simple elements which takes place in dead tissue of plants and animals under the influence of bacteria, everywhere present in the lower air, in water, and on the earth (see BACTERIA AND BACTERIOLOGY). Putrefaction is another term for decay. When the decomposing substances are proteins, ptomaines and ill-smelling gases are generally produced; thus, sulphureted hydrogen is the characteristic poisonous and bad-smelling gas of rotten eggs. Putrefaction is aided by warmth, moisture, and exposure to the air, but very high and very low temperatures interfere with its progress. According to this principle, meats are kept fresh in cold storage,



From the statue by Thiry
PYGMALION

and milk is heated to boiling and protected from the air to prevent its becoming sour. Certain antiseptics arrest the progress of putrefaction. T.B.J.

Related Subjects. Various phases of this subject are treated in these volumes in the following articles:

Antiseptic	Food Products, Preservation of
Cold Storage	Pasteur, Louis
Decomposition	Ptomaines
Fermentation	

PUTRID SEA. See AZOV, SEA OF.

PUTTING THE SHOT. See SHOT, PUTTING THE.

PUTTY, a cement made of whiting (fine chalk) and boiled linseed oil, used to fill cavities in wood finishing, and to fasten window panes in sashes. For inside work, white lead is often added, together with a little tallow to keep the mixture from getting too hard. A formula for a cheap and good putty is as follows: Mix equal parts of finely ground whiting and white lead with enough linseed oil to make a thick liquid, then add whiting or commercial putty until the mixture has the desired thickness

PUYE CLIFFS. See NEW MEXICO (National Monuments).

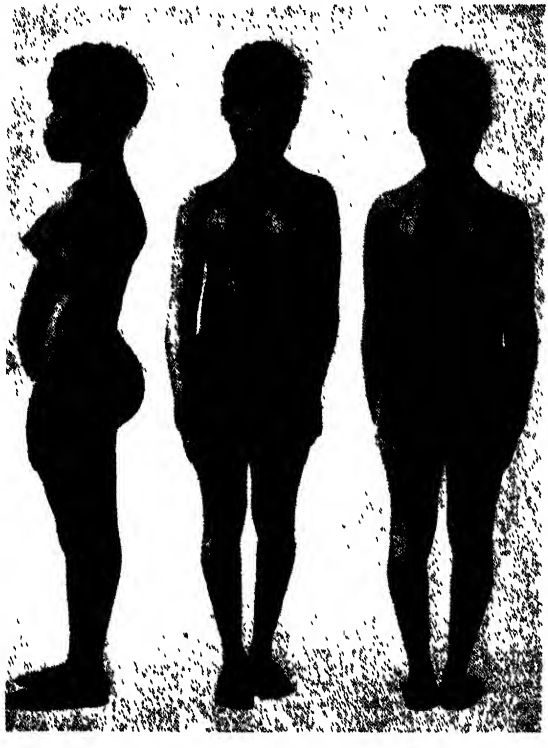
PU-YI. See CHINA (History)

PUYSEGUR, MARQUIS DE. See HYPNOTISM

PYE, HENRY JAMES. See POET LAUREATE

PYGMALION, *pig ma' lih on,* a mythical Grecian sculptor who became so disgusted with the wickedness of the women of his native town that he scorned them all and refused to marry. All the love which he should have given to a woman went to his art, and as a punishment, Venus decreed that he should fall in love with a statue of Galatea which he had carved. So great did this love become that Venus in response to his prayers endowed the statue with life, and the nymph then became Pygmalion's wife.

PYGMIES, *pig' miz,* a name applied to those peoples who are far below normal in stature and who exhibit this peculiarity as a racial characteristic, not as an individual defect. The men of such races are, on an average, less than five feet tall. In general, pygmies may be divided into two groups—the African, or Negrillos, and the Asiatic, or Negritos. The Asiatic are found chiefly in the Malay Peninsula and in the Philippine and Andaman islands, and the African in a region on the continent extending about 200 miles north and south of the equator. A Negrito tribe has also been discovered in Dutch New Guinea. All pygmies of unmixed blood, whether Asiatic or African, have certain pronounced characteristics. These include, besides their short stature, closely curling hair, flattened nose, huge mouth, receding chin, an abundance of woolly hair on the body, and arms long in proportion to the legs. The skin of Negritos is dark brown or black, while the Negrillos are of a reddish-yellow or chocolate-brown color. The Negrillos are the shortest human beings on the globe, averaging but four and one-half feet in height. Unlike the Negritos, they have very prominent abdomens.



AN AFRICAN PYGMY

Three views of the same village belle. The height is about four feet.

Pygmies have the customs and habits of a primitive people. They wear little clothing, live in huts made of branches and foliage, and obtain their food by hunting and fishing. It is said, however, that the Negrillos surpass in intelligence some larger negro races of Africa. They speak a corrupt form of the language used by several neighboring tribes. The Malay Peninsula pygmies, however, have their own distinctive language. C.W.

Derivation of Term. The name *pygmy,* from the Greek word for a measure of length corresponding to the distance between the elbow and the knuckles, was first used by Homer in the *Iliad.* He applied it to a race of dwarfs described as living in a region far to the south.

PYLADES, *pil' ah deez.* See ORESTES.

PYLE, *pile,* HOWARD (1853-1911), an American painter and author. His illustrations for children, a line of work in which he excelled, his pictures of old colonial days, and his representations of life on the sea are all characterized by vigor, simplicity, and directness, and he was equally successful with pen-and-ink work, wash drawings, and oil paintings. Pyle was born in Wilmington, Del. His art studies

were pursued at a private Philadelphia school and at the New York Art Students' League. He started his career as an illustrator for *Harper's Monthly*, to which he contributed for many years. Pyle taught for a time at the Drexel Institute in Philadelphia, where he had as a pupil the talented Maxfield Parrish (which see). He was elected to the National Academy in 1907.

His Books. Among the books which he wrote and illustrated are *Merry Adventures of Robin Hood, Twilight Land, The Garden Behind the Moon, The Story of Sir Launcelot,* and *Stolen Treasure.*

PYLON, an entrance to a temple or an ornamental gate of monumental proportions, flanked on both sides by a pyramidal tower. It is now applied to a tower from which airplanes may be launched, or to obelisks which mark the course of an aerodrome.

PYLORUS, *pi lo' rus,* a circular fold of mucous membrane, forming a gate at the opening from the stomach into the intestine. See illustration under ALIMENTARY CANAL; STOMACH.

PYM, *pim,* JOHN (1584-1643), an English statesman who took an active part in opposing the tyranny of Charles I. He belonged to the Puritan party (see PURITANS), and was one of its most influential members. Pym was elected to both the Short and Long Parliaments, and while the latter was in session, he led the movement to impeach the Earl of Strafford (see STRAFFORD). In 1642, the year before his death, his arrest, together with that of four other members, was sought by Charles I, who entered the halls of Parliament in person to apprehend them. They, however, had been forewarned, and when the king called for the unruly members, particularly John Pym, he found their places vacant. Pym's participation in the civil war between king and Parliament ended only with his death.

PYORRHOEA, properly PYORRHOEA ALVEOLARIS, *pi o re' ah al ve o la' ris,* a disease of the gums and bony structure surrounding the teeth. Early indications of pyorrhoea are redness and flabbiness of the gums, starting at the "gum line," with tendency to bleeding. The gums recede from the teeth, and pus, which forms in the crevices, may be seen exuding from around the roots and in the spaces between the teeth. Continued inflammation of the gums and bony structure causes the teeth to loosen and fall out, but even more serious than this effect is the spread of pus and bacteria through the body. Joint rheumatism (arthritis), heart trouble, indigestion, and other ailments often can be traced to cases of pyorrhoea.

The trouble arises from infection of the membrane that lines the sockets in which the teeth lie. This membrane becomes diseased through injuries from unequal pressure of crooked teeth and poor dental work; through deposits of fermenting food particles; and through irritation from tartar or scale. Pyorrhoea is curable in the early stages. Redness or softness of the gums, with tendency to bleeding, should have the attention of a dentist. Treatment consists in removal of tartar, antiseptic cleansing of the gums, and hypodermic injection of emetine into the root canal. Hygienic care of the teeth, as outlined in these volumes in the article TEETH, will help to prevent the disease Correction of irregularities by a competent dentist is also advisable. See DENTISTRY. W.A.E.

PYRAMID. A solid whose base is a polygon, and whose faces are triangles all of which meet at a common point, is called a *pyramid.*

When the base of a pyramid is a regular polygon, as a square, an equilateral triangle, or a regular pentagon, and the faces are equal isosceles triangles, the pyramid is called a *regular pyramid,* as Fig. 1. The point where the faces meet (*a* in Fig. 1) is called the *vertex.* The perpendicular distance from the vertex to the base (*a c* in Fig 1) is the altitude of the pyramid. The distance from the vertex to the middle point of any side of the base is the *slant height* (*a b* in Fig. 1).

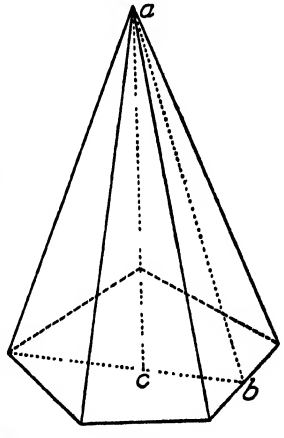


FIG 1
Explanation appears in the text

Since each face is a triangle, its area is the product of one side of the base and one-half of the slant height. (The slant height is the altitude of each triangular face.) *The area of the entire lateral surface of a pyramid is the product of the perimeter of the base and one-half the slant height.*

Volume. (*a*) Build of cardboard a prism and a pyramid of the same dimensions. Fill the pyramid with sand or sugar. Empty its contents into the prism. Do this until the prism is full. You will find that the prism holds three times as much as the pyramid. (*b*) Cut a prism and a pyramid of the same base and altitude, from clay, putty, or from a potato. Weigh both. You will find that the prism weighs three times as much as the pyramid.

The volume of a pyramid is one-third as great as the volume of a prism of the same dimensions, or *The volume of a pyramid is the area of*

the base multiplied by one-third the altitude. The formula is: Volume of pyramid = area of base $\times \frac{\text{altitude}}{3}$.

Problems. 1. How many square feet of sheeting on the sides of a steeple, a square pyramid in shape, with base 12 feet square, and slant height 20 feet?

Lateral surface = perimeter $\times \frac{\text{slant height}}{2}$

Number of sq. ft. = $(4 \times 12) \times 20 = 480$

2. What is the volume of a pyramid whose base is 10 feet square and altitude 15 feet?

Volume of pyramid = area of base $\times \frac{\text{altitude}}{3}$

Volume in cu. ft. = $10 \times 10 \times 15 = 500$

3. Find the lateral surface of a six-sided pyramid whose slant height is 30 feet, and each side of whose base is 8 feet.

4 What is the volume of a pyramid whose base is a rectangle 10 x 15 feet, and whose altitude is 21 feet?

5. At $.45 a square foot, how much will it cost to gild a five-sided pyramidal steeple if the base is 10 feet on each side and the slant height is 16 feet?

6. A pyramid has as its base a right triangle with sides respectively 10 inches, 15 inches, and 18 inches; its altitude is 24 inches. Find the volume of the pyramid and the number of square inches of lateral surface.

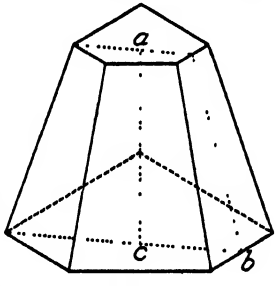


FIG. 2
See Fig 1 for explanation of symbols.

Frustum of a Pyramid. The part of a pyramid between the base and a plane which cuts the pyramid parallel to the base is called a frustum. (See Fig. 2.)

Lateral Area. Its lateral area is made up of trapezoids whose lower edges make the perimeter of the lower base of the frustum, and whose upper edges make the perimeter of the upper base of the frustum. *To find the area of the lateral surface of a frustum, multiply one-half the sum of the perimeters of the bases by the slant height.* See TRAPEZIUM.

Volume. To find the volume of a frustum, multiply the sum of the areas of the two bases and the square root of their product by one-third of the distance between the bases. J.W.Y.

Problems. 1. How many square inches of sheet iron are used in making a bread pan 8 inches by 5 inches at the bottom and 9 inches by 6 inches at the top, the slant height being $2\frac{1}{2}$ inches? (The reader will note that it is the frustum of a rectangular pyramid.)

2 perimeters = $2 \times (9+6) + 2 \times (8+5) = 56$
Lateral surface in sq. in. = $28\frac{1}{2} \times 2\frac{1}{2} = 70$
Bottom surface in sq. in = $8 \times 5 = 40$
Number sq in of sheet iron = 110

2 How many cubic inches in the volume of a tin box whose lower base is 10 inches square, whose upper base is 6 inches square and whose altitude is 8 inches?

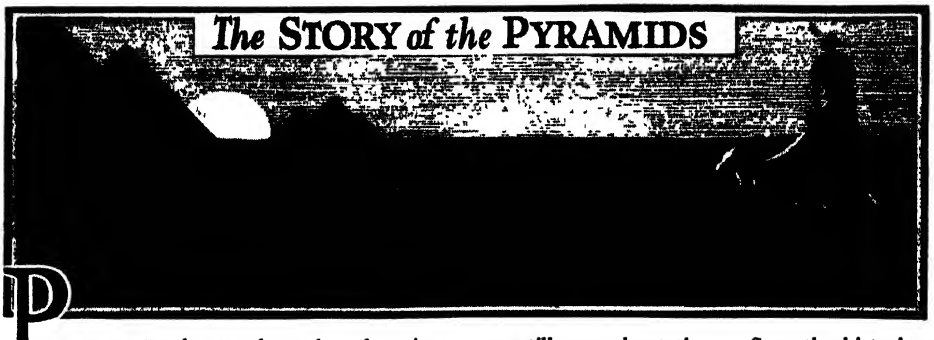
Area of two bases and the square root of their product = $(10 \times 10) + (6 \times 6) + \sqrt{60 \times 60} = 196$.
Volume in cu in = $196 \times 8\frac{1}{3} = 522\frac{2}{3}$.

3. Find the area of the lateral surface of a frustum of a regular pyramid whose lower base is a square 10 feet on a side, upper base 5 feet on a side, and slant height 16 feet.

4 A monument in the form of a frustum of a square pyramid contains 445 cubic feet of stone. The lower base is 8 feet on a side, the upper base 5 feet on a side What is the height of the monument?

PYRAMID LAKE. See NEVADA (Rivers and Lakes).

PYRAMID PEAK, an elevation of the Elk Mountain range, 13,885 feet high, in Pitkin County, Colo.



PYRAMIDS, the royal tombs of ancient Egypt, gigantic structures that have been in existence since the early period of human history. The most famous—a group of three near Gizeh—were numbered among the Seven Wonders of the Ancient World, and the modern age still marvels at them. Says the historian Myers:

These venerable memorials of the early world, although they stand so far back in the gray dawn of the historic morning, mark not the beginning but in some respects the perfection of Egyptian art.



Photo P & A

OLDEST STONE STRUCTURE IN THE WORLD

The step pyramid of Sakhara, near Cairo, Egypt, is declared to be the oldest example of the handiwork of man now in existence It was built by the second king of the third dynasty. Of the antiquity of some of these great piles, one writer says: "The pyramids themselves, doting with age, have forgotten the names of their founders"

They speak of long periods of human life, of ages of growth and experience, lying behind the era they represent.

Another point of view is expressed by the travel lecturer, Burton Holmes:

> Eloquent of the wealth and power of those kings, they represent the suffering, pain, and toil of dumb, uncounted multitudes of slaves—they are the highest, costliest, cruelest tombs the world has ever seen

The celebrated Gizeh pyramids are located about five miles west of Cairo, on the border of the Libyan Desert. The largest of these, the Great Pyramid, was erected by Khufu, whom the Greeks called Cheops. He was the second king of the fourth dynasty, and lived, probably, twenty-nine centuries before the Christian Era. Herodotus, the Greek historian, is authority for the statement that it took 100,000 men twenty years to erect the Great Pyramid. Its base covers thirteen acres, and its triangular sides rise, at the present time, to an apex 451 feet (perpendicularly) above the ground; the original height was 481 feet. One Egyptologist has estimated that this massive structure—the largest piece of masonry ever built—contains 2,300,000 stone blocks, which have an average size of forty cubic feet. The weight of the structure is estimated to be not less than 6,848,000 tons. Ages ago this pyramid had an outer casing made of polished stones, all carefully fitted together, but this has long since disappeared, leaving exposed the central core of rough-hewn blocks. Before the smooth covering was worn away, it was thought that there were but two things that could reach the top of the pyramid—the eagle and the reptile—but now,

> "The mighty pyramids of stone
> That wedgelike cleave the desert airs,
> When nearer seen and better known
> Are but gigantic flights of stairs."

The sides are climbed by thousands of tourists, assisted by white-robed Arab guides. The apex has lost some of its crowning blocks, and one finds, on reaching the top, a level platform thirty-six feet square.

The entrance leading to the interior passage is in the north side of the structure, about forty-eight feet above the ground. This passageway descends gradually to a horizontal corridor which opens into an underground chamber. From this room a sloping, blind passage leads to an ascending corridor, which opens into the Chamber of Queens and the Great Hall. The latter, a high, narrow vault, terminates in another narrow passage which leads to the King's Chamber. This, the most marvelous of the interior rooms, is lined with polished granite and contains the crumbling stone coffin of the king.

The Second and Third Pyramids of the Gizeh group are also massive structures, their perpendicular heights being 450 feet and 204 feet, respectively. The second was built by Chephren, the successor of Cheops, and the third by Mycerinus, the successor of Chephren.

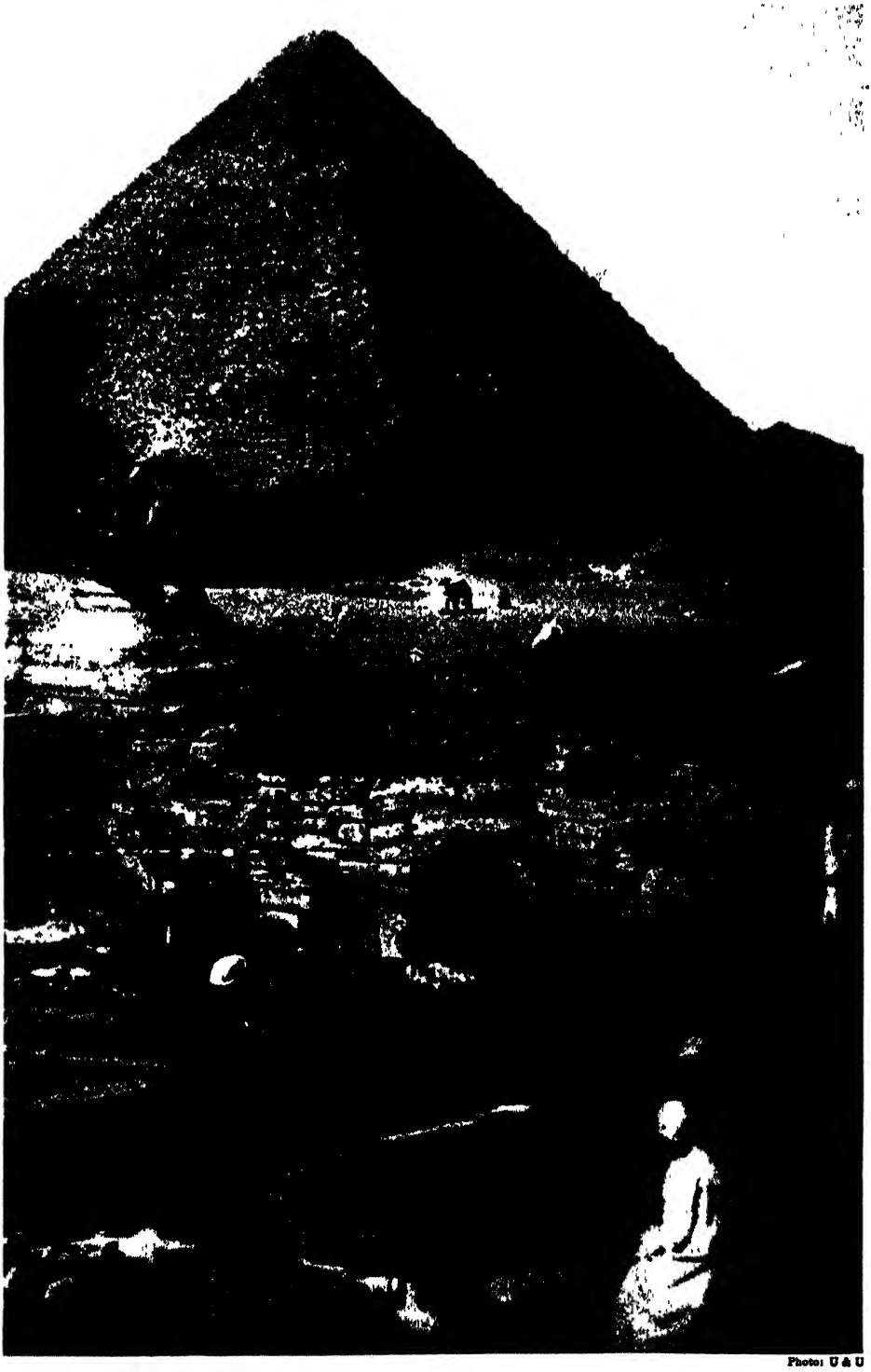


Photo: U & U

The Egyptians' Pride. Ruins of a granite temple whose existence was not known until 1853. In the left background is the Sphinx, and farther back, the Great Pyramid.

There are three small pyramids south of the last-named structure, supposed to have been erected for other members of the royal family. There are in existence about seventy-five Egyptian pyramids, arranged in groups that extend in a north-and-south direction from Abu Roâsh to Medum, on the west side of the Nile. Many of these are in ruins, but all are interesting subjects for study.

Related Subjects. The reader is referred in these volumes to the following articles

Cheops	Sarcophagus
Egypt (Ancient)	Seven Wonders of the World
Embalming	

PYRAMIDS, BATTLE OF THE. See BONAPARTE, NAPOLEON.

PYRAMUS AND THISBE, *pir' a mus, thiz' be,* in ancient folklore, two unfortunate young lovers whose home was in Babylon. They lived in adjoining houses, but their parents were so averse to the idea of their marriage that they were not allowed to see each other, and had to carry on their courtship through a small opening in the wall. Finally, they planned to meet by moonlight beneath a certain mulberry tree outside the city. Thisbe arrived first, but was frightened by a lion and fled, dropping her veil, which the lion caught and tore with his bloody mouth. When Pyramus reached the spot, some time later, he saw the lion and the bloodstained veil, and, fancying that Thisbe had been killed, stabbed himself with his dagger. Thisbe, finding his dead body, seized the dagger and plunged it into her own bosom. The fruit of the mulberry tree, which had up to that time been white, changed to blood red. The story is told by the poet Ovid (which see).

PYRENEES, *pir' e neez,* a mountain chain which forms an almost impassable barrier between France and Spain. The Pyrenees extend from east to west for a distance of 280 miles—from the Bay of Biscay to the Mediterranean—and cover an area of over 20,000 square miles. Their average height is only about 3,500 feet, but in the central ranges there are several peaks over 10,000 feet in altitude. In this section the culminating point of the mountains is reached in Mont Maladetta, which is 11,168 feet above the sea. Most of the glacier fields on the Pyrenees are found on the northern slopes of the central ranges, the total glacial area being considerably less than that of the Alps. There are several minerals found in these mountains, chiefly copper, iron, lead, silver, and cobalt; the iron mines at the Biscay end are the source of a prosperous industry.

Beautiful forests of box, fir, pine, evergreen, and oak cover the slopes, though the scenery of the Pyrenees is inferior in grandeur to the Alpine. As there are but two passes across these mountains that are suitable as roads—the Col de la Perche and the Col de Somport—the chain is a barrier to commerce, and France and Spain have traded with each other chiefly by sea. On the northern slopes of the mountains there are several well-known watering places, and on the south slope of the Eastern Pyrenees is Andorra, one of the smallest republics in the world. See ANDORRA.

Traffic between France and Spain has been greatly facilitated by the opening of two trans-Pyrennean railways, initiated prior to the World War. The first, opened in 1928, runs from Pau to Saragossa, via the Canfranc tunnel; the second, an electrified line opened in July, 1929, unites Toulouse, France, and Barcelona, Spain, and shortens the rail journey from Paris to Barcelona by several hours. This line climbs to a height of 5,200 feet in crossing the Pyrences, and there are more than forty tunnels in its central sector of fifty-seven miles. See illustration, page 5897.

PYRIDINE, *pir' ih din.* See COAL TAR (Derivatives).

PYRITE, *pi' rite,* OR **PYRITES,** *pi ri' teez.* History tells us that the first settlers who came to Jamestown, Va., in search of gold discovered a yellow substance in the rocks of that vicinity, which they took for the treasure they were seeking. They mined a shipload of this substance and sent it to England, so the story goes, believing they had become immensely wealthy, but when this "gold" was tested by fire, it separated into a black, worthless mass and a volume of ill-smelling gas. This substance was *pyrite,* or *iron pyrite,* a compound of iron and sulphur, which, because of the incident mentioned, and others like it, is often termed *fool's gold.* Pyrite has a brassy, yellow color, and is very hard and brittle. It often occurs in crystals in the form of cubes, and forms beautiful cabinet specimens. Most of it, however, occurs in veins in rock. It is used extensively in the manufacture of sulphuric acid (which see).

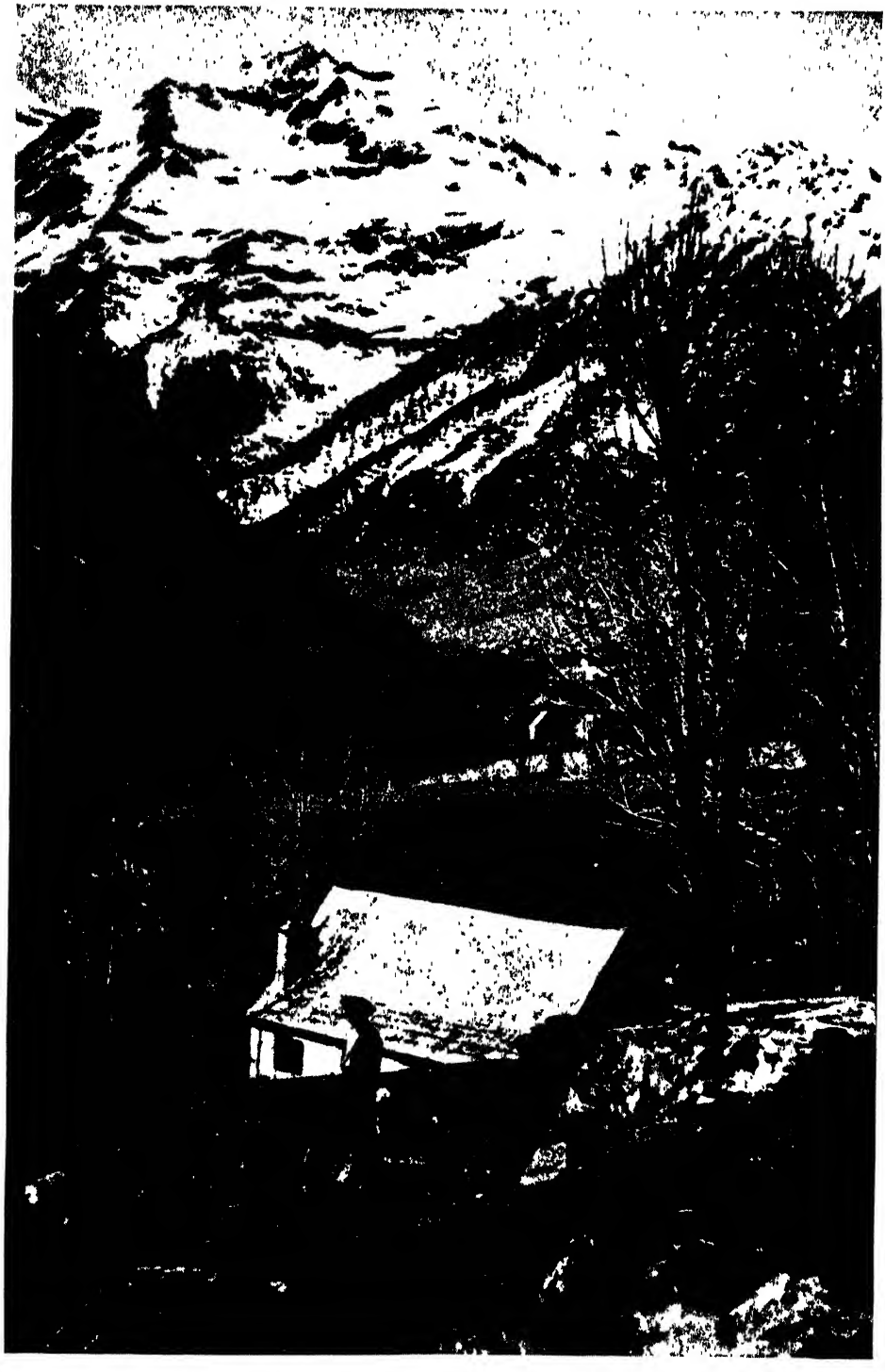
Copper pyrite, which is a compound of copper and sulphur, is of a darker yellow than iron, and may be smelted for the copper. It sometimes contains small quantities of gold and silver. See COPPER GLANCE. A.N.W.

Chemical Formula. The formula for iron pyrite is FeS_2, that is, a molecule contains one atom of iron and two atoms of sulphur.

PYROGRAPHY, the art of ornamenting the surface of wood or leather with designs by means of a heated point or fine flame, or by stamping with hot plates and reproducing the design by pressure. Velvet and even glass may be employed.

PYROLIGNEOUS, ACID. *pi ro lig' ne us,* See ACETIC ACID.

PYROLUSITE, *pi ro lu' site.* See MANGANESE.



The Barrier between France and Spain. Snow-encrusted mountains overlooking a beautiful valley on the French side of the Pyrenees. The text tells how this hitherto impassable barrier to commerce has been overcome.

PYROMETRY, *pi rom' e trih*, the measuring of the expansion of bodies by heat, specifically, through the use of a pyrometer, or instrument designed for the purpose. It implies the measurement of temperatures beyond the range of the mercurial thermometer. Certain heats are distinguishable as follows:

Dull red heat indicates about. . . . .975° F.
Cherry red heat indicates about. . . .1450° F.
Orange heat indicates about. . . . . .2000° F
White heat indicates about. . . . . .2350° F
Dazzling white heat indicates about.2700° F

PYROPE, *pi' rope*. See GARNET.

PYROTECHNICS. See FIREWORKS.

PYROXENE, *pi' rok seen*, the name applied to a group of silicate minerals, occurring in crystals in limestones, dolomite, gneisses, and some other rocks. Their colors range from pure white to green, brown, and black, depending chiefly upon the abundance and condition of the iron in them. *Diopside*, sometimes polished and used for ornamental purposes, is colorless or pale green; *salite* is a dark-green variety; *augite*, dark green or black, is the common pyroxene of igneous rocks. There are notable deposits of pyroxene in Northern New York and Canada. A.N.W.

Chemical Formula. The simplified formula for the pyroxenes is $CaMgSi_2O_6$, representing one atom of calcium, one of magnesium, two of silicon, and six of oxygen.

PYROXYLIN, *pi rok' sih lin*. See CELLULOID; CELLULOSE; SMOKELESS POWDER.

PYRRHA, *pir' ah*. See DEUCALION.

PYRRHIC VICTORY. See article PYRRHUS, below.

PYRRHUS, *pir' us* (about 318-272 B.C.), a Greek military leader, declared by some authorities to have been a distant relative of Alexander the Great. During his youth he recovered the throne of Epirus, which his father had lost, but Pyrrhus himself was deposed by his people in 302 B.C., and forced to take refuge in Egypt. After marrying the daughter of Ptolemy Soter, Pyrrhus returned to his native country, recovered the throne, and undertook the conquest of Macedonia, with success.

The Tarentines, a Greek colony of lower Italy, and their neighbors, appealed to Pyrrhus in 281 B.C. for aid against the surrounding enemies. Pyrrhus hastened to their assistance with 25,000 men and twenty elephants; the Romans were conquered, chiefly because of the large part the elephants played in the battle. In 279 B.C., Pyrrhus won the Battle of Asculum, achieving the famous "Pyrrhic victory"; although he conquered his foe, it was with so great a loss that, as he surveyed the thousands of dead, he remarked, "Another such victory and I shall be ruined."

Later, he assisted the Greeks of Sicily against the Carthaginians, at first successfully, but met a heavy defeat in 275 B.C. During the last three years of his life, he renewed his invasions of Macedonia, led an army into the Peloponnesus, and unsuccessfully attacked Sparta. At Argos he met Antigonus of Macedon in a pitched fight, and was killed.

PYTHAGORAS, *pih thag' o ras*, a Greek philosopher who lived in the sixth century B.C. Little is known definitely of his life or teachings, but it seems certain that he was born on the island of Samos, and that he founded, in the Greek city of Crotona, in Italy, a brotherhood among the aristocrats of that place. A fundamental proposition of geometry is known to have been first proved by him. This is the theorem that the square on the hypotenuse of a right-angled triangle is equal to the sum of the squares on the other two sides. Mathematicians call it the *47th proposition in Euclid*.

The philosophy of Pythagoras seems to have included a belief in the transmigration of the soul. There is also connected with the Pythagorean school the idea that the earth is a sphere, and that it revolves about a central fire. The Pythagorean brothers, being aristocrats, were looked upon with suspicion by the members of the radical popular party of the period, and in a political uprising, most of them were killed. It is not known whether Pythagoras perished in the outbreak, or whether he had withdrawn to Metapontum before the uprising, and died there.

Related Subjects. Readers interested in the so-called Pythagorean Theorem are referred to the article GEOMETRY (Some Famous Theorems) See, also, TRIANGLE.

PYTHAGOREAN THEOREM. See GEOMETRY (The Story of Geometry); TRIANGLE; PYTHAGORAS.

PYTHIAN, *pith' i an*, **GAMES,** a national festival of the ancient Greeks, celebrated in honor of Apollo, at Delphi, near the shrine and oracle of the god. The name had reference to the dragon Python, the slaughter of which was accomplished by Apollo, five days after his birth. The games were the second of the four great national festivals, the others being the Olympian, the Nemean, and the Isthmian. At first the Pythian games were celebrated every ninth year, and consisted merely of a contest between singers, but a new series was inaugurated about 586 B.C. Thereafter, the celebration occurred every four years, until about A.D. 300. Athletic contests and horse racing were added, and eventually, dramatists, historians, poets, and artists competed for honors. The prizes were the laurel wreath and the palm branch.

Related Subjects. The reader is referred in these volumes to the following articles.

Athletics
Festivals
Isthmian Games
Nemean Games
Olympian Games
Apollo
Python (myth)



Photo Visual Education Service

"OH, GO 'WAY AND LET ME SLEEP"
A python, photographed soon after swallowing a young antelope

PYTHIAS, *pith' ih as.* See DAMON AND PYTHIAS.

PYTHIAS, KNIGHTS OF, a fraternal and benevolent order, originally based, as its name suggests, on the story of the self-sacrificing friendship of Damon and Pythias (which see). It is confined to the United States and Canada, and in point of numbers, ranks next to the Masonic and Odd Fellow orders.

The society was founded in 1864 in Washington, D. C, by Justus H. Rathbone, and the membership of the first lodge was composed largely of government clerks In accordance with the name, members are pledged to help each other, "friendship to the death" being the theoretical ideal, and the society since its establishment has paid out over $50,000,000 in benefits. An endowment department, in which membership is voluntary, cares for an insurance feature; a uniform branch exists, with semi-military features, such as drilling and marching.

The government is vested in a single supreme lodge, below which there are grand lodges and subordinate lodges. The pledges of secrecy taken by members are extremely rigid. Three ranks, or degrees, are conferred in the Pythian society, those of page, esquire, and knight See FRATERNAL SOCIETIES.

PYTHON. The snakes commonly called python are, for the most part, inhabitants of the Old World. The largest is found in Indo-China and the Malay States, and reaches a length of thirty feet. This snake is arboreal; that is, it spends most of its time in trees, where it suns itself and lies in wait for its food, which consists of birds and mammals that come within reach of its fangs. Although it is usually found in trees, it is very agile both on the ground and in the water, where it swims very well.

Many weird stories are told of the animals which the python devours as food, but it is highly probable that in reality it cannot eat animals larger than goats. It kills a captured victim by crushing it in its coils, and after rendering an animal a shapeless mass, it swallows it, head foremost. Only one of the pythons occurs in the New World, and that one is much smaller than the reptile mentioned above. It is found in South Mexico. L.H.

Classification. The largest Old World python is called *Python reticulatus* The New World python is *Loxoceinus bicolor* Pythons belong to the subfamily *Pythonidae* of the family *Boidae.*

PYTHON, *pi' thon,* a famous serpent which, in Greek myth, was said to have been born from the mud and foul waters which remained on the earth after Deucalion's flood. This hideous monster lived near Delphi, and preyed upon the cattle and even the people of the surrounding country. Apollo, when he came to Delphi, killed the animal with his arrows. Thereafter, the place and the oracle of Apollo were given the name of Pytho, and Apollo instituted the Pythian Games to celebrate his victory. Originally, this was a nature myth; the poisonous serpent was the miasmatic fog from the winding swamp, which was dispersed by the sun's rays. The sun was represented by Apollo. See DEUCALION.

PYTHRAS. See POLAR EXPLORATION.

THE WORLD BOOK
MODERN PICTORIAL
COMPREHENSIVE

Qq

Q is the seventeenth letter of the English alphabet. In the original Phoenician, from which the letter was derived, its name was *qoph*, which meant *head*, and in form it was a rude sketch of the back of the head and neck—nothing more than a circle with a short, vertical line running through it. It represented a somewhat different sound from the *kaph*, from which modern *k* is taken; but when the Greeks took over the alphabet, they had no sound for it, and it fell into disuse. The Romans, on the other hand, adopted it and made use of it in combination with *u*, as it is used in English to-day. In reality, it is an entirely superfluous letter in English, for its place could be filled by *kw* in all ordinary words, as *queen*, and by *k* alone in such occasional words from the French as *coquettish*. *Q* exists in English, therefore, solely because the Phoenicians had need of it to represent a sound distinct from *k*.

Q. E. D. See GEOMETRY (Terms Used).

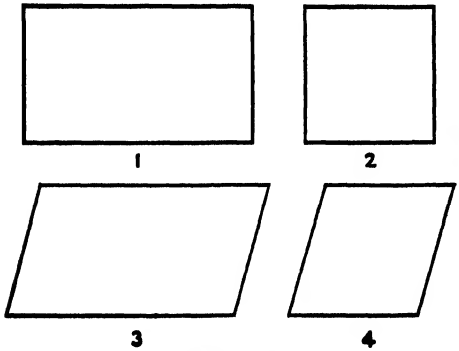
Q. E. F. See GEOMETRY (Terms Used).

QOPH, the origin of the letter Q. See Q.

QUACK GRASS. See COUCH GRASS.

QUADRA, *kwod' rah*, a Spanish explorer. See VANCOUVER ISLAND.

QUADRANT, *kwod' rant*, an instrument formerly used in navigation and in surveying for ascertaining the altitude of the sun. The name was given it because the instrument embodied an arc of 90°, or one-fourth of a circle. It has been almost entirely superseded by the sextant (which see).



QUADRILATERALS
(1) Rectangle. (2) Square. (3) Rhomboid (4) Rhombus.

QUADRILATERAL, *kwod rih lat' ur al*, a plane figure having four straight sides. A quadrilateral whose opposite sides are parallel is a parallelogram. Its opposite sides being parallel, it follows that they are equal, and that its opposite *angles* are equal. If the angles of a parallelogram are right angles, the figure is a *rectangle*; if the sides of a rectangle are equal, the figure is a *square*. When all the sides of a parallelogram are equal, the figure is a *rhombus*.

A quadrilateral having one set of parallel sides is a *trapezoid*. If the other two sides are non-parallel and equal, the trapezoid is *isosceles*.

Trapezoid and Trapezium. Mathematicians do not agree on the meaning of these two terms. The foregoing definition is the one accepted generally in the United States to-day, while in England the quadrilateral having two parallel sides is called a *trapezium*. The terms are sometimes used interchangeably in the United States. Some writers define a trapezoid as "a quadrilateral having only one pair of sides parallel," but this is not the best modern practice. J.W.Y.

Related Subjects. The reader is referred in these volumes to the following articles.

Mensuration	Rhombus
Rectangle	Square

QUADRILLE, *kwah dril'*. See DANCING (Modern Dances).

QUADROON, *kwod roon'*. See MULATTO.

QUADRUPLEX TELEGRAPH. See TELEGRAPH.

QUAESTOR, *kwes' tor*, an ancient Roman magistrate. When authentic history began in Rome, the consuls were the executive officers of the republic, and as such had charge of criminal and financial matters. The quaestors soon appeared as assistants to the consuls, and were at first probably appointed by them to act as their representatives in some matters; they always stood in special relations to the consul. At first, their functions seem to have been mainly concerned with criminal matters, in which they were judges or presidents of trial courts, but later, and under the empire, their duties were mainly of a financial nature, for they served as state treasurers. Their number at first, like the consuls, was two; under the empire they increased to twenty, as necessities of state required. See CONSUL.

QUAHOG, *kwah' hog*. See CLAM.



Photo Visual Education Service

A FLOCK OF QUAIL, OR BOBWHITES

QUAI d'ORSAY, *ka dawr sa'*, the name given to the Foreign Office of the republic of France. It is the office of the Minister of Foreign Affairs.

QUAIL. In the Old World, this name is applied to various species of game birds belonging to the pheasant family. In North America, it is used for several birds of the grouse family, of which the best-known is the bird called *bobwhite* and *quail* in the Northern and Eastern United States, *quail* in Canada, and *partridge* in the South. See GROUSE; PARTRIDGE.



FOOD OF THE QUAIL

The bobwhite, so-called from its clear, whistling notes (*ah bob-white*, with the last syllable sharply accented), is the only species of quail native to the section east of the Mississippi River, its ordinary range extending from the Gulf states to Southern Ontario. It is a plump bird, ten inches in length, and has reddish-brown plumage, with markings of black, white, and buff, aptly described as a "speckled jacket." The bobwhite is a bird of the grasses rather than the trees, and its nest is always found on the ground. There are ten to eighteen or more white eggs in a brood. Weed seeds comprise half the food of this quail, and the remainder consists of grain (from the stubble), wild fruits, and insects. It devours such pests as chinch bugs, grasshoppers, the cotton-boll weevil, army worms, and cutworms, thus proving itself a true friend of the farmer. The flesh of the bobwhite is a popular table food, and so many of the birds have been killed by hunters that many states have adopted laws for their protection.

Other species of American quail are the *California*, *Gambel's*, *mountain*, *blue*, and *Mearn's*. The mountain is the largest, and the Mearn's the smallest. All have noticeable crests and beautiful plumage, slate-blue, olive-brown, and black and white being prominent colors. They are found in the Western and the Southwestern states.

The European quail is a migratory bird. American quails are not migratory, and as they are ground-feeders, they often suffer in the Northern States during severe winters. D.L.

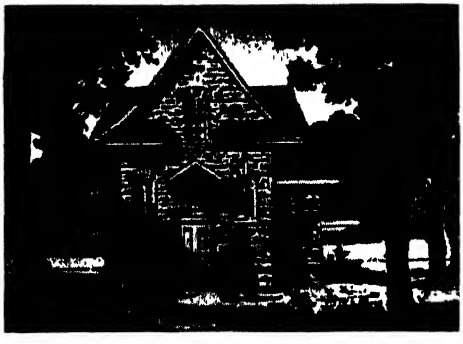
Scientific Names. Old World quails belong to the family *Phasianidae*. North American quails are placed in *Tetraonidae* The bobwhite is *Colinus virginianus*. The California and Gambel's quails belong to the genus *Lophortyx*; the mountain to *Oreortyx*; the blue to *Callipepla*; the Mearn's to *Cyrtonyx*.

QUAKER POET. See WHITTIER, JOHN GREENLEAF.

QUAKERS, OR SOCIETY OF FRIENDS, a Christian sect founded in England about 1648, by George Fox (which see). The members of this body have always called themselves Friends; the name Quaker, bestowed in derision, originated in Fox's exhortation to the magistrates to "tremble at the word of the Lord." Notwithstanding severe persecution, both in the British Isles and in America, where the Quaker movement took root in 1656, the Society of Friends spread rapidly. Pennsylvania Colony was founded by a famous Quaker, the good William Penn (which see),

and the denomination exercised considerable influence in colonial days in several of the other middle colonies. A Quaker became President of the United States when Herbert Hoover was inaugurated, in 1929.

In the United States, a division occurred in the ranks of the Friends in 1827, when Elias Hicks began preaching a denial of the miraculous birth of Christ, and advanced other views deemed unorthodox. The followers of Hicks



FIRST QUAKER MEETINGHOUSE

The illustration, drawn from an old engraving, is that of the first house of worship of the Society of Friends in America

are known as Hicksite Quakers, and the original body as Orthodox Quakers. At the present time, there are in the United States about 96,000 members in the Orthodox branch, and about 18,000 in the Hicksite. (The Hicksites themselves prefer the name Liberal Branch.) Another group of separatists, the Wilburites, who differ from the general body in regard to certain points of discipline and administrative methods, number about 3,500. In Great Britain, Canada, Australia, and Ireland, the members of the Orthodox branch number 26,500.

Originally, the Quakers were set apart from other Christian sects by several marked peculiarities. They dressed simply in gray, used the "thee" and "thou" forms in daily conversation, and conducted their religious services in accordance with their belief that no one should take part until he felt called upon to do so by the Holy Spirit. In many sections, however, these customs have been greatly modified or abandoned. There are other points from which they have not deviated. They believe only in a spiritual observance of baptism and the Lord's Supper, not in an outward celebration of these sacraments. Probably the central point of their teaching is the doctrine that the individual is personally directed by the Holy Spirit—the "Inner Light." They believe the taking and administering of oaths to be contrary to Christ's teaching, and they are equally opposed to war in any form. Their principle of non-resistance has at times subjected them to injustice and persecution. In general, the Quakers have exercised a beneficial influence wherever they have settled.

QUAKING ASPEN. See ASPEN.

QUALITATIVE ANALYSIS. See ANALYSIS.

QUANTA. See QUANTUM THEORY.

QUANTITATIVE ANALYSIS. See ANALYSIS.

QUANTITY. When anything has size, weight, number, mass, or volume which may be measured, increased, or diminished, it has quantity. The term may also mean a certain or considerable amount, as in the sentences

(1) Quantities of these shells are found on the shore

(2) He bought a quantity of rubber in South America

In mathematics, numbers are numerical quantities (see NEGATIVE QUANTITY; also, ALGEBRA). In prosody, quantity signifies the relative length of time occupied in pronouncing a syllable; in music, the quantity of the note denotes the relative length of time it is held. J W Y.

QUANTUM THEORY, a theory proposed originally in 1901 by the German physicist Max Planck (1858-), which is based on the supposition that energy is discontinuous According to Planck's hypothesis, when a body radiates or absorbs energy, the vibrating atoms or electrons lose or gain energy in sudden jumps, and the energy is emitted or absorbed in discrete units called *quanta* Planck was led to this conception in the effort to solve a perplexing difficulty in regard to the distribution of energy in the spectra of bodies emitting heat. In the long wave-lengths, there was a difference between theory and experiment that could not be overcome when referred to the classical theory, which assumes that bodies emit and absorb energy continuously, by imperceptible degrees. Though he originally applied the new theory to the constitution of heat radiation alone, in 1912 Planck made it include all kinds of radiation, limiting it, however, to the emission of energy. Most authorities to-day regard it as applicable both to emission and absorption.

According to the classical theory, a vibrating system may contain any amount of energy. In the quantum theory, the contained energy of a radiating body is an equal multiple of the quantum peculiar to that body. The quanta are not the same for all radiators, because the value of the energy unit is always proportional to the frequency of the vibrations (number of oscillations per second). In all cases, there is a fundamental quantity called *Planck's constant.* Multiplying this constant by the frequency of the oscillating body gives the value of the quantum in ergs. Mathematically

these relationships are expressed as follows: $E=hv$, where h is Planck's constant and v is the vibration frequency. The numerical value of h is 6.56×10^{-27}.

As an example, take the frequency at which a heated body radiates the largest possible amount of energy in the infra-red region. This frequency is about 1.5×10^{14}. The corresponding quantum is therefore $6.56\times10^{-27}\times1.5\times10^{14}$, or approximately one ten-millionth of a millionth of an erg. Energy emitted in units so minute seems continuous to the human mind, but it should be remembered that in science infinitesimal size of units does not deny their separateness. The concept of discontinuous energy is in keeping with the discontinuity of matter and electricity, which has passed from theory to provable fact.

The quantum theory has been applied with notable success to the photo-electric effect, which concerns the property possessed by certain bodies, especially metals, of emitting electrons when subjected to the action of light Its greatest triumph, however, has been its application to the structure of the atom, an achievement of the Danish physicist, Niels Bohr. According to the generally accepted theory, the atom consists of a central nucleus, about which revolve electrons in orbits similar to those followed by the planets in their journeys around the sun. Dr Bohr regards each of the planetary electrons as revolving in a fixed orbit, or *quantum path*, and as moving in that orbit with an invariable speed. During its rotation about the nucleus, the electron does not radiate energy, but it may be excited to move from its orbit to an inner one, or may be "kicked" entirely outside the orbital field, and start moving back. Whenever an electron moves from one orbit to another, it does so in definite jumps, and in the process it liberates a quantum of energy. This phase of the quantum theory has been worked out in great detail and has received confirmation from experiments with the spectroscope.

The classical theory of the propagation of light in transverse waves through a medium called the ether has not been reconciled with the quantum theory, and such reconciliation is one of the unsolved problems of modern physics. H.S.E.

Related Subjects. In this connection, the following articles give supplementary information

Atom	Light
Chemistry (subhead)	Matter
Electricity	Physics
Ether	Spectrum Analysis

QUAPAW, *kwah' paw.* See INDIANS, AMERICAN (Most Important Tribes).

QUARANTINE, *kwahr' an teen,* a term used to signify the isolation of persons, places, animals, and effects which carry, or are reasonably supposed to carry, danger of infection. The period of quarantine depends on the particular disease to be guarded against. In an earlier day, the word applied only to the forty days during which ships suspected of carrying infection were held outside of ports and forbidden to land passengers or freight. The word is from the Latin *quadraginta,* meaning *forty.*

International Quarantine. At the present time, any ship entering port is quarantined; it is boarded by an inspecting officer of the government, who receives from the officer in command a statement as to the health of crew and passengers. Heavy penalties may be inflicted for false statements or for concealment of facts. According to the officer's report, the ship receives either a *clean bill* or a *foul bill,* and either proceeds to its wharf without delay; or is quarantined for the time specified in regulations for various diseases. If the ship has been detained by contagious disease, every part of the vessel, as well as the cargo, is disinfected before it can proceed to its wharf. The quarantine station is always established at some distance from the landing places. In the United States, the quarantine service is under control of the Public Health Service. The diseases against which the United States maintains quarantine are Asiatic cholera, yellow fever, smallpox, typhus fever, leprosy, plague, and anthrax.

A ship under quarantine flies a yellow flag by day, and at night a white light is displayed at the masthead. Vessels or owners of vessels acting as carriers are exempt from responsibility or liability for non-delivery or delayed delivery of cargoes, if such arise from quarantine.

Before the World War, quarantine stations were limited to maritime ports; since 1918, stations have been set up on the borders of Poland, Czechoslovakia, Rumania, Hungary, and the Baltic States, for observation of travelers from countries harboring contagious diseases.

Other Kinds of Quarantine. A state or province, a city, town, or village, a community, a single household, or a person may be subject to quarantine regulations. General government regulations provide for protection of a country as a whole; each smaller political division may take steps to defend itself individually against infectious diseases. The power vested in the authorities for quarantine purposes is practically, and within reason, unlimited, even overriding, when considered necessary, personal-property rights. An official who wilfully exceeds his duty or powers, however, may be held personally liable for loss or damage to life or property.

When an infectious disease such as infantile paralysis, measles, or scarlet fever invades a home, a placard is attached to the house in

some conspicuous position, to warn others of the presence of dangerous illness within. In some cases, persons in the home who have been exposed to the disease are not allowed to leave the house until after a specified period. Isolation of the patient and his nurse in one part of the house is necessary when others continue to reside there. Tradesmen who make deliveries do not enter the place, but leave their packages on the porch. Doctors and nurses are supposed to take special precautions in regard to disinfection, and such measures are very important when a doctor goes from house to house during an epidemic. These and similar regulations are rigorously enforced in all civilized communities, and have been very effective in reducing mortality and checking epidemics.

Quarantine of Plants and Animals. Numerous injurious insect pests have been introduced into the United States and Canada through the importation of diseased plants. In both countries, laws have been passed providing for the inspection of plants shipped from other countries, and giving proper authority to specified boards or commissions to prohibit the landing of any shipments known to carry infection. Farms, districts, and states and provinces may be placed under quarantine when it is necessary to check the spread of plant diseases or insect pests that have gained entrance (see, in this connection, CORN BORER). Among the imported insects that American agriculture is fighting are the Japanese beetle, the European corn borer, the Mediterranean fruit fly, and the gypsy and brown-tail moths.

Diseased livestock is also kept out of the country, or is quarantined in areas within the country, by legal authority. Both the United States and Canada have enacted legislation to prevent the spread of animal diseases by the application of quarantine measures. For a typical operation of such measures, see the article FOOT AND MOUTH DISEASE.

Related Subjects. In addition to the references given above, the reader is referred in these volumes to the following articles:

Bill of Health	Epidemic	Insect (with list)
Disease	Fumigation	Sanitary Science

QUARRY AND QUARRYING. A *quarry* and a *mine* differ in but two essentials. The former is an excavation in the earth, open to all observers, from which are taken large masses of rock of high merchantable quality, such as marble, granite, limestone, sandstone, and other like building stones. An ordinary mine, while it is an excavation, is not visible from the surface of the earth; the excavation is often over half a mile below the surface, and is reached by shafts sunk to the various levels, where workmen seek metals and minerals. Such is the legal aspect of the two terms.

The operations by which valuable rocks in huge masses are taken from their natural locations and prepared for commercial purposes are known as *quarrying*. There are three processes which are employed in a quarry. One is known as the *plug and feather* method; another, the *explosive* method; the third, *channeling by machinery*.

Plug and Feather Method. Pressure, constantly increased and exerted uniformly, will split a mass of rock along a line of cleavage. By employing such means, workmen can break rock into such masses and into such shapes as suit their needs; the use of explosives, on the contrary, while sure to detach large masses, may destroy much valuable stone by breaking it into pieces too small for their intended use.

The principal tools in the plug and feather method are a wedge, or plug, flat on its two opposite surfaces, and two "feathers," pieces of steel, each rounded on one side and flat on the other. Into the rock, in a straight line at short intervals, holes about three-fourths of an inch in diameter are drilled. A plug is placed between two feathers, and these three pieces are inserted in a hole. When all the holes along the line where the rock is to be broken are thus filled, the workmen begin to drive the plugs and feathers downward. Each of the wedges thus formed is driven only a little way at a time, and thus the pressure is kept practically uniform; eventually, it is so great that the rock breaks.

The mass thus released is turned over to other workmen, who may in turn subject it further to the plug and feather process, or they may break it into smaller pieces by such hand tools as saws, drills, picks, hammers, and wedges. Still another class of artisans, more skilled and possessed of the artistic sense, work the smaller pieces into merchantable forms. When large pillars, columns, and the like are prepared, machinery is employed in rounding and polishing them.

Explosive Method. Usually, this is employed in detaching great masses of rock from their beds, and for this process, either dynamite or gunpowder, connected at a safe distance with a slow-burning fuse, is commonly used, the choice depending upon the results sought from the explosion. If finely broken pieces of stone are desired, and these are to be further crushed for road-making, for manufacturing concrete, and the like, dynamite acts powerfully. When stones of as large size as possible are sought, the milder explosive is employed. In either instance, drill holes are sunk deep into the solid mass of rock parallel to the exposed perpendicular face of the mass; into these the explosive is then poured, and electric wires are connected with each charge. The explosions resulting when the charges are fired are thus simultaneous, and sometimes hundreds of tons are thus forced out in a few very large pieces.



Photo. Georgia Marble Co.

A MARBLE QUARRY IN GEORGIA

5905

Channeling Machine. Most large quarries employ an ingenious device to make the first cuts into a solid bed of rock. This so-called channeling machine looks not unlike a miniature locomotive. Attached to its sides are sets of long, pointed chisels. The entire machine moves along a track on the smooth surface of the solid rock, and in its progress the chisels are forced downward. Little by little, they cut channels in the rock to any desired depth, even to one of ten feet; the width of the channel is a little more than an inch. Obviously, the channel cuts are vertical; the mass of rock must be completely detached from the solid part below by blasting, or by the plug and feather method, explained above.

Extent of the Industry. Of granite, limestone, marble, and sandstone quarries in the United States, it is not possible at any time to state the exact number; new quarries are frequently opened, and old ones are often abandoned. There are, on an average, about 1,925, divided among leading stones as follows·

Granite	384	Marble . .	50
Limestone. . .	926	Sandstone . .	280

The principal producing states in each commodity are roughly as follows:

Granite. Those states possessing over thirty quarries are California, Connecticut, Georgia, Louisiana, Massachusetts, Minnesota, New Hampshire, North Carolina, Pennsylvania, Vermont

Limestone The states with over thirty quarries producing this popular building stone are Illinois, Indiana, Iowa, Kansas, Kentucky, Minnesota, Missouri, New York, Ohio, Pennsylvania, Tennessee, Wisconsin.

Marble. There are marble quarries to the number of five or more in each of the following states· California, Georgia, Massachusetts, New York, Pennsylvania, Tennessee, Vermont.

Sandstone The states with twenty or more sandstone quarries are California, Colorado, New York, Ohio, Pennsylvania, West Virginia, Wisconsin

Related Subjects. The attention of the reader is called to the following articles in these volumes.

Building Stone	Granite	Marble
Explosives	Limestone	Sandstone

QUART, a measure of capacity used in the United States, Canada, and Great Britain for measuring both dry and liquid substances. (For tables, see DENOMINATE NUMBERS.) In the United States, the liquid quart is equal to one-fourth of a gallon, and to .9463 liter in the metric system, and contains 57.75 cubic inches; the dry quart is equal to one-thirty-second of a bushel and to 1.101 liter, and contains 67.2 cubic inches. Quarts in both measurements are divided into two pints. A vessel 4 x 4 x 3.6 inches will hold a liquid quart. The British imperial quart, both dry and liquid, contains 69.3185 cubic inches, or 1.136 liter. See, also, METRIC SYSTEM.

QUARTE. See FENCING.

QUARTER-DECK, that part of the upper deck of a boat lying between the stern and mainmast, which in men-of-war is reserved for the use of officers alone. It has consequently become a symbol of authority, and according to an old custom of the sea, it is saluted by all who step upon it, the officers present returning the salute. The forward part of the right side, or starboard, is reserved for the senior officer. A sailor who came to the quarter-deck with a complaint always stood near the mast at the forward end of the deck; thus he was said to "come to the mainmast"—an expression still heard among seamen, but the phrase is dying out.

QUARTERING ACT. See REVOLUTIONARY WAR (Causes).

QUARTER-SAWED OAK. See LUMBER.

QUARTO. See FOLIO.

QUARTZ, *kworts*, a compound of silicon and oxygen, is one of the most common of minerals. It is a constituent of many rocks, such as granite and gneiss, and is easily recognized in granite by its resemblance to broken glass. Most sandstones consist of small grains of quartz (sand) held together by some binder such as calcite or mica. Quartz is the hardest of the common minerals; only rare minerals, such as topaz, corundum, and diamond, are harder. It is highly resistant to weathering processes, and is insoluble in water and most acids.

There are many varieties of the mineral. It occurs in hexagonal crystals and also in massive form. Pure transparent quartz is called *rock crystal*, and is sometimes cut for gem purposes under the name of *Bristol diamond*. Varieties of transparent quartz colored by impurities include *amethyst*, which is violet; *false topaz*, pale yellow in tint, and *rose* and *smoky quartz*. Chalcedony, flint, and jasper are fine-grained forms of this valuable mineral.

Quartz has many uses. It is employed in making sandpaper, grindstone, and various other abrasives; quartz sands are extensively used in the manufacture of glass and mortar, and for many other purposes. Rock crystal is employed in making optical apparatus and devices. When fused, it can be used as a substitute for glass. A method of fusing has been devised which promises to make quantity production practicable. Fused quartz transmits the ultra-violet rays of light, which will not pass through ordinary glass, and it can transmit these rays around curves. It also has the property of expanding only in the slightest degree under intense heat. For these reasons, it is invaluable for lenses of microscopes, as a material for precision instruments, for making instruments to effect cures by transmitting ultra-violet rays, and for devices used in astronomy and photography. A.N.W.

Chemical Formula. Quartz is silicon dioxide, SiO_2; that is, a molecule contains one atom of silicon and two atoms of oxygen.

Related Subjects. The reader is referred in these volumes to the following articles

Amethyst	Jasper
Chalcedony (with list)	Minerals
Flint	Sand
Granite	Sandstone

QUATERNARY, *kwah tur' na rie,* **PERIOD,** the second period of the Cenozoic Era and the latest period of geologic time, extending from the end of the Tertiary Period until and including the present time. The name, which means *fourth,* is a survival of an early classification in which the rocks now named Paleozoic were called *Primary,* and those now named Mesozoic were called *Secondary.* The period comprises two epochs—the Pleistocene, commonly called *Glacial,* and the Holocene, also called *Recent, Present,* or *Human Epoch.* The Quaternary Period is characterized by the appearance of the earliest known men upon the earth. For this reason, it has sometimes been called the *Age of Man,* and was formerly set off by some geologists in a separate era called the *Psychozoic.* L.LaF.

Related Subjects. The reader is referred in these volumes to the following articles

Cenozoic Era	Glacial Epoch
Geology (Divisions of Time)	Human Epoch
	Tertiary Period

QUATSINO SOUND. See VANCOUVER ISLAND.

QUAWK. See NIGHT HERON.



QUEBEC, *kwe bek',* in early days known as LOWER CANADA, or CANADA EAST, is the oldest and the largest province of the Dominion of Canada, and the home of nearly two millions of people of French descent, who for more than a century and a half have preserved their language, their religion, their social customs, and their laws, making of themselves a nation within a nation.

Location and Extent. Quebec is bounded on the south by Ontario, a corner of New York, the Northern New England states, New Brunswick, and Chaleur Bay. It extends eastward to the Atlantic Ocean and northward to Hudson Strait, and the greater part of its western boundary is formed by Hudson and James bays, the remainder by Ontario. Labrador, belonging to Newfoundland, separates it from the ocean on the northeast. Its most easterly point is 500 miles farther east than Porto Rico, and its western boundary has practically the longitude of Buffalo, N. Y.

From 1912, when the province annexed the territory of Ungava, to 1927, Quebec had an area of 706,834 square miles. However, the settlement of the long-waged dispute over the Quebec-Labrador boundary, when made by the Privy Council of the Empire, in 1927, gave to Labrador 112,400 square miles of the disputed territory. Quebec's area is reduced, therefore, to 594,434 square miles. It covers an area nearly equal to that of six American states farthest west—Washington, Oregon, California, Idaho, Arizona, and Utah. Anticosti and a number of other islands belong to the province.

The People. When Canada became a British possession, in 1763, there were about 70,000 French in the country. The British government wisely allowed these new subjects to retain their laws, religion, language, and social customs, these have been handed down from one generation to another practically without change, so that to-day we find in the French portion of Quebec a picture of the old Norman customs of a past age. This life is at its best in the great, fertile region bordering the Saint Lawrence River and extending eastward from Montreal.

French is the common language of the land; in many communities, English is seldom heard. In the part that is west of Montreal, and in the region lying between the Richelieu and Saint Lawrence rivers and the New England states, known as the Eastern Townships, the great majority of the inhabitants are of English and Scottish descent. The habits of life and social customs in this region closely resemble those of the Northern New England states. The region was originally settled by people from the English colonies who sided with England in the Revolutionary War. In general, the English people control the great financial enterprises of the province, but in numbers they are only thirteen per cent of the population of the province. The total population of Quebec

in 1921 was 2,361,199; it was estimated at 2,650,400 in 1928.

Religion. About ninety per cent of the people are communicants of the Roman Catholic Church. The Protestant denominations in order of their membership are the Anglican (Episcopal), Presbyterian, Methodist, and Lutheran. The Presbyterians and Methodists are now identified with the United Church of Canada.

Surface and Scenery. According to surface, Quebec is naturally divided into three regions —the plateau north of the Saint Lawrence, the long, level plain bordering the river on the south, and the region crossed by the Notre Dame Mountains and comprising the southeastern counties. The plateau north of the Saint Lawrence occupies by far the largest of these regions. On it the Laurentian Mountains rise here and there, but nowhere attain a high altitude. A height of land separating the rivers flowing into the Saint Lawrence from those flowing into Hudson Bay crosses this plateau in an irregular line from east to west



LOCATION MAP

The illustration shows the size of Quebec in comparison with the other provinces, and the proportion of the Dominion it occupies

The lowland bordering on the Saint Lawrence is nearly level, but it is crossed by a number of isolated peaks extending from north to south, and known as the Monteregian Hills. The region crossed by the Notre Dame Mountains, which are a low extension of the Appalachian system, is rolling and hilly and in some places mountainous. The highest peak, Table Top Mountain, has an altitude of 4,000 feet.

Rivers and Lakes. Quebec is a land of lakes and rivers. The Saint Lawrence is the great gateway to the interior of the vast continent, and the main artery through which most of the rivers of the province find an outlet to the sea. The principal streams flowing into the Saint Lawrence from the north are the Ottawa, forming a part of the southern boundary, and which, not far from its mouth, receives the Gatineau; the Saint Maurice, noted for its volume of water and falls; and the Saguenay, with its magnificent scenery. On the south are the Richelieu, which drains Lake Champlain; the Chaudière, with its beautiful falls; and the Saint Francis, valuable for its water power.

The great region north of the height of land is drained into Hudson Bay and the Atlantic Ocean, and it is the portion which drains into the Atlantic that is now part of Labrador. Most of the streams flowing into the Saint Lawrence from the north descend the plateau in a series of cascades, which add much to the beauty of the region.

Lake Megantic, north of Maine, is a favorite resort for fishermen. Lake Memphremagog, nestling among the hills with its southern end in Vermont, is visited by many tourists every season. Lake Saint John, about 100 miles north of Quebec, is a favorite resort easily reached by rail, or by steamer by way of the Saguenay. These are the best-known of the many lakes which lend their beauty to the Quebec landscape.

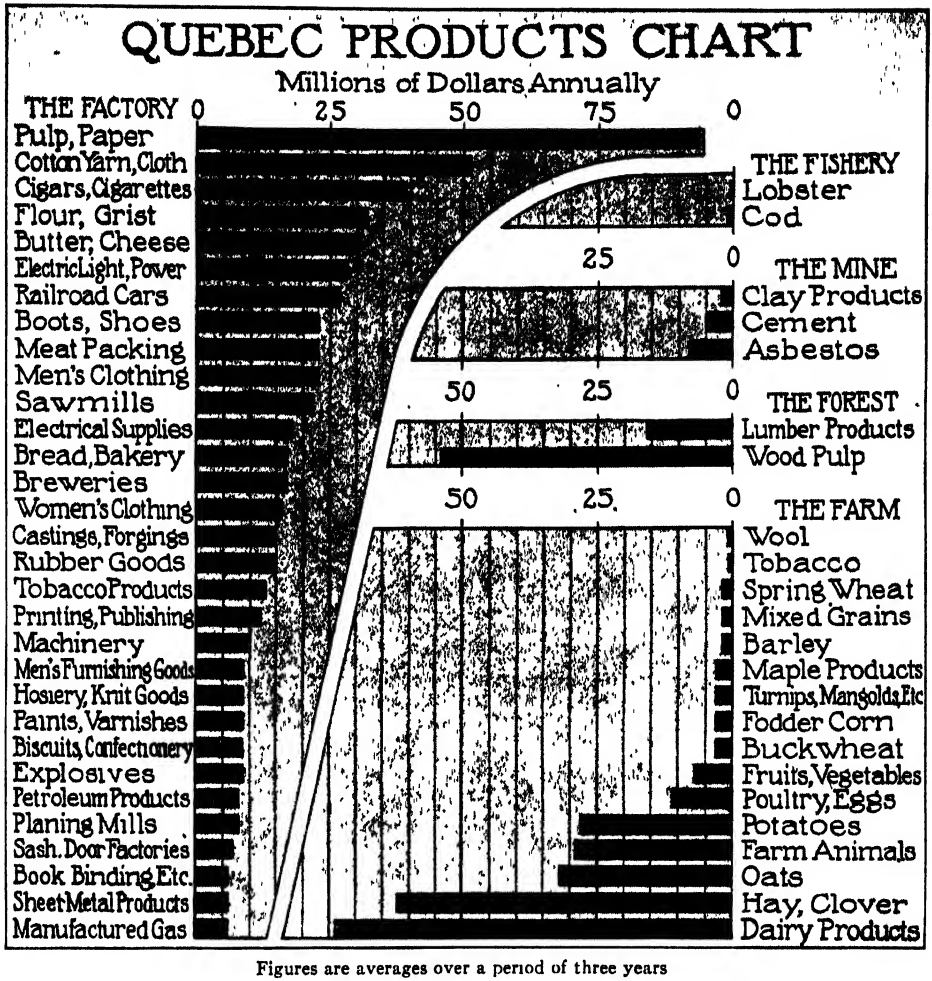
Climate. In the southern part of the province and along the Saint Lawrence, the summers are warm, with occasional hot days; and the winters are long and cold, with deep snows. Spring is short and autumn is pleasant. The northern part of the province has a cold climate, with long, severe winters and short, hot summers. Everywhere the rainfall is ample for agriculture. The atmosphere is clear and crisp, and the entire province has an invigorating and healthful climate. The dry air and absence of fogs make quite low temperatures bearable

Plants and Animals. In the valleys of the Saint Lawrence and the Ottawa, and in the Eastern Townships, are forests of hard- and soft-wood trees. The oak, the ash, the maple, and the spruce and pine are here. The northern wild flowers, the hepatica, the claytonia, and the violet, adorn the fields and waysides in the spring, and the aster, goldenrod, and other favorites are abundant in late summer and early autumn. Nearly all the vast territory north of the Saint Lawrence is covered with forests of spruce, tamarack, and jack pine.

The moose, the caribou, the deer, the bear, and the lynx are the valuable large animals, while among the smaller animals are found the otter, the mink, the fox, the weasel, the muskrat, the skunk, and the beaver, all valuable for their fur. The hunter and trapper still range the forests, and Quebec's contribution to the world's production of fur is important. Stringent laws have recently been enacted by the Quebec parliament for preventing the extermination of the most valuable fur-bearing animals

Thousands of waterfowl frequent the lakes to nest in summer, and all the birds found in a northern clime may be seen throughout the summer in the southern part of the province. The Canada goose is of especial importance.

Minerals and Mines. Until recent years, there has been little development of Quebec's mineral fields, but the development of a new copper mine at Noranda is putting the province among the leaders in mineral production. Quebec supplies about eighty per cent of the world's output of asbestos, the mines being located in the Eastern Townships, chiefly in Thetford and Danville. The yearly output



Figures are averages over a period of three years

is valued at about $10;500,000. The annual output of cement has a value of about $6,500,000, and that of marble and limestone, over $2,500,000. Some copper is mined in the Eastern Townships, and silver in paying quantities is obtained in the reduction of the ore. Gold and copper-bearing sulphides have been found in quantities in Western Quebec Owing to the absence of coal, but little iron is mined. Graphite, minerals valuable for paints, phosphates, mica, manganese, and a number of other minerals exist, and the total yearly mineral production is valued at from $20,000,000 to $30,000,000 In the absence of coal, the extensive deposits of peat may be classed as a reserve mineral asset which, no doubt, will be developed. Already it is air-dried and used as a fuel; two tons of peat thus prepared equal a ton of coal in fuel value.

Fisheries. Fishing is an important occupation for the people dwelling along the shores of the Gulf of Saint Lawrence. The total annual value of the fisheries is over $3,000,000. Cod, herring, and salmon, in the order named, yield the largest revenue. Lobsters and mackerel are also taken in large numbers.

Forests and Lumber. The forest area of Quebec is not fully known, as the great forests of Ungava have been only partially surveyed. However, it is known that north of 57° latitude the country is barren and practically without trees. Exclusive of this unsurveyed portion, there are about 130,000,000 acres of forest standing, estimated to be worth $600,000,000. The trees include white pine, spruce, balsam, hemlock, red pine, cedar, and tamarack, among the soft woods, and oak, beech, birch, and maple among the hard woods. Lumbering is one of the leading industries of the province, and is carried on chiefly around the sources of the Ottawa, the Gatineau, the Saint Maurice, and a few other streams north of

the Saint Lawrence. The logs are cut in the winter and floated down the streams to the mills in the spring, when the water is high. Large lumber mills are found on all these rivers; but some of the timber is made into rafts that are towed long distances by steamers.

Spruce is cut in the largest quantities, since it is the most desirable wood for the manufacture of pulp. According to a provision of the Quebec government, all the pulpwood cut on the Crown lands in Canada must be manufactured into pulp. This provision has meant a practical subsidy to the pulp-and-paper manufacturing industry. The pulpwood exported to the United States is cut from the private forests. The value of this industry is estimated to be about $75,000,000, and much of the product is sold in the United States. One-half of the pulp production of Canada comes from Quebec.

Both the Dominion and the provincial government exercise close supervision of the forests, and the cutting of timber on all licensed lands is so restricted as to prevent destruction of the forests; stumpage dues are charged on all timber cut, provisions for the prevention of fire are required, and diameter limits protect immature trees. In addition, there is a comprehensive program for conservation, and large areas are set aside as forest reserves.

Agriculture. Agriculture is the leading occupation. Over one-half the occupied land is under cultivation, the cultivated area amounting to about 17,000,000 acres. This, however, is but a small part of the tillable land in the province. The region south of the Saint Lawrence is highly fertile, with the exception of small areas on the mountains, and the land is all occupied. The region north of the Ottawa and the island of Montreal are also excellent for agriculture. There are large areas of fertile land on the plateau north of the Saint Lawrence, but these areas are separated by tracts of rocky land unsuited to tillage.

The growing of crops, such as hay, grain, potatoes, etc., dairying, and livestock-raising are the main branches of agriculture, though fruit-farming is also important. About thirty-nine per cent of the value of field crops is represented by hay and clover, and twenty-three per cent by potatoes. Oats is the principal grain, followed by buckwheat, barley, spring wheat, and corn. Soil and climatic conditions for flax are favorable, and the opportunities for an excellent export trade are causing the government to encourage its cultivation.

Tobacco varieties suitable to the climate are grown in the regions on both sides of the Saint Lawrence from Berthier and Yamaska counties south to the United States border. The industry is at an early stage of development, and it is protected by a high duty on imported leaf. The maple-sugar production is an important source of revenue to the people, though the yield has decreased in recent years with the introduction of synthetic syrup, and the higher profits realized when the maple is sold for the lumber. The annual yield averages $4,000,000 in value, and the United States buys most of the maple sugar.

Fruit-growing is most extensive in the Eastern Townships, and in the Ottawa and Saint Lawrence valleys. Splendid qualities of apples are grown, though the acreage available for this crop far exceeds the area in cultivation. The Fameuse apples, of Canadian origin, are one of the most valuable of the crops. Quebec produces annually about 112,000 barrels of apples, as well as large quantities of pears, plums, and strawberries; and the Montreal muskmelons are famous for their delicious flavor. Bee-keeping and honey production in Quebec ranks next to Ontario, and this branch of agriculture receives considerable government aid. Livestock-raising, including the breeding of cattle, horses, sheep, and swine, is particularly suited to the climate of Quebec, and the dairy industry has been long established. Most of the butter is produced on the farms and is known as dairy butter; however, there are many creameries and cheese factories. The popularity of furs for both winter and summer wear has given fur farming great impetus; the most valuable animal thus bred is the silver fox.

The provincial and Dominion governments offer generous assistance to agriculture. There are farmers' societies and clubs through which the government dispenses financial aid for the purchase of better stock and seeds, and agricultural machinery for community use. Demonstration farms and expert farm advisers are within reach of all the farmers, and, in addition, there are three agricultural colleges. The economic condition of the Quebec farmer is almost without exception prosperous.

Manufactures. Quebec ranks next to Ontario in the value and variety of its manufactures, with more than 7,100 industrial establishments. Almost every stream is a source of water power, and the provincial government has reserved the water rights of most of the streams and lakes, leasing them to private companies. Quebec has a vast amount of power for hydroelectric plants, which is being steadily developed. Industries are attracted to Quebec because of the cheap and plentiful power and abundant labor supply. The forests offer the resources for the most important manufactures. The pulp-and-paper industry leads the list, with an invested capital of more than $191,000,000, and the allied paper industries swell the sum to about $200,000,000.

Quebec is the leading province in the manufacture of textiles, and leather and boot-and-shoe factories are located at Montreal, Quebec,



Photo U & U

QUEBEC'S GREAT STEEL BRIDGE

and Saint Hyacinthe. There are ironworks at Montreal, Three Rivers, and Sherbrooke The leading factories for making cotton and woolen goods are at Montreal, Valleyfield, Saint Hyacinthe, and Sherbrooke. The annual value of the manufactures is over $811,000,000. Many industries of the United States have branch factories in Quebec, as in other Canadian provinces, not only for the Canadian market, but also to take advantage of the preferential tariff to supply the foreign demand.

Transportation and Commerce. The Saint Lawrence River is navigable for ocean-going vessels as far as Montreal, and is the great commercial highway of the province. The Richelieu is obstructed by rapids at Chambly, but a canal at that point makes the river navigable for its entire length for boats of light draught. The Canadian Pacific and the Canadian National railways with their branches furnish ample railway accommodation to the region south of the Saint Lawrence and along the northern shore of that river. Branches of these lines are being extended northward as fast as the development of the new country seems to warrant. Telegraph and telephone lines are common throughout the settled regions. The movement for good roads in Quebec has resulted in developing one of the finest highway systems in Canada.

Montreal and Quebec are the leading commercial centers, and from the port of Montreal large quantities of wheat, grown in the Northwest provinces, are shipped to Europe. Montreal is, in fact, the greatest grain-exporting port on the continent. Other leading exports are lumber, wood pulp, butter and cheese, beef, and fruit. Most of the foreign trade is with Great Britain and the United States. The imports consist almost wholly of manufactured products, such as clothing, textiles, machinery, and hardware. The yearly exports amount to about $355,000,000, and the imports to about $222,000,000.

Education. The public schools are under the control of a superintendent of public instruction, who is assisted by a council of thirty-five members. This council is divided into two committees, one having the management of the Roman Catholic schools and the other that of the Protestant schools. All the schools are either Protestant or Catholic. The main support of the schools is local taxation. Owners of property pay their taxes into the Roman Catholic or Protestant or neutral panels, respectively. Public companies pay into the latter panel, which is divided between the other two on the basis of population. There are also government grants, divided on the same basis. Each school municipality is in the immediate care of its local board. The

QUESTIONS ON QUEBEC

(An Outline suitable for Quebec will be found with the article "Province.")

How does the highest altitude in Quebec compare with that in Ontario? In British Columbia? In Saskatchewan? In New York?

Why cannot definite statistics as to the forest area of this province be given?

If Texas had a forest area as large as the known forest area of Quebec, how many square miles of its surface would be unforested?

Why have voters a better chance to choose a good man to represent them in the legislature than have the voters of Illinois or New York?

What is the largest surface region of Quebec? What is the outstanding physical feature of this region?

How many of the fifty largest cities of Canada are in Quebec? (See table under article CITY.)

What proportion of the total area of Canada does this province comprise? How does the next largest province compare with it in area?

With what countries does Quebec carry on most of its foreign trade? Which are more valuable, the imports or the exports? How much?

How large a percentage of the inhabitants of the province speak English as their native tongue?

Where did the original inhabitants of the Eastern Townships come from?

Of what important mineral substance does the whole world outside of Quebec produce only about one-fourth as much as is produced in that province?

Why is very little iron mined?

Since Quebec has little coal, how do you account for the development of its manufactures?

Describe the farming region in the valley of the Saint Lawrence, stretching eastward from Montreal.

Name seven animals of this province which are important for their fur. Name four others in which the hunter is interested.

What, in general, is the economic condition of the Quebec farmer? How has the province helped in this?

How do you account for the fact that the French language spoken by the educated in Quebec has not lost its purity of form?

How many French-speaking people were there in Canada when it came into the possession of England?

How many are there to-day in this one province?

What were the official names of Quebec from 1791 to 1867?

What good effect did the War of 1812 have on affairs in Canada?

What lake is partly in this province and partly in one of the New England states?

How did the British, when they came into possession of Canada, secure the good will of the French population?

educational institutions are divided into three classes: (1) primary schools, which include elementary, model, or intermediate schools, and academic or high schools; (2) classical colleges; (3) technical schools, such as schools of agriculture, schools of mines, and schools of art. The two leading universities are McGill, at the head of the Protestant schools, and Laval, at the head of the Catholic schools; both schools are in Montreal.

Government and History

Government. The chief executive is a lieutenant governor, appointed by the Dominion government. He is assisted by a council of ministers, who are responsible to the legislative assembly. The head of the council, or premier, is the executive head of the government. The legislature consists of two houses—a council of twenty-four members appointed for life, and an elective assembly of eighty-five members, elected for five years. Members are not

required to be residents of the district which they are chosen to represent, and this plan gives the voters a better opportunity to choose the best men. Quebec has sixty-five members in the Dominion House of Commons, and the number from each of the other provinces is regulated by this number, which was originally assigned to Quebec with the provision that it should remain unchanged [see CANADA (The Dominion Government)]. Twenty-four senators are sent to the Dominion Senate. Quebec is the only Canadian province which does not enfranchise women.

For purposes of local government, the province is divided into counties, townships, and municipalities, each having its special officers.

History. Until the conquest of Canada by Great Britain, 1759-1763, the history of Quebec was the history of New France. For a detailed account of this period see CANADA (History of Canada).

By the Treaty of Paris, in 1763, all of Canada was ceded to Great Britain, and a radical change of administration followed. The British government secured the good will of their new French subjects by leaving the laws and institutions under which they had lived undisturbed, and by allowing the free use of the French language in the government and in education. At the breaking out of the Revolutionary War, emissaries from the American colonies tried to induce the Canadians to join with them in the struggle for an independent government, but without success. An expedition against Quebec under Montgomery and Arnold in 1775 was defeated, and Montgomery was slain. Another against Montreal failed. At the close of the war, a large number of English and Scottish settlers entered the country from the United States, the original settlers of the Eastern Townships being among them.

In 1791 the English settlers in the western part of Canada petitioned for a separate government, and the provinces of Upper Canada (Ontario) and Lower Canada (Quebec) were organized. In 1812 there was a growing antagonism between the English and French elements of the population, but the War of 1812-1814 between England and the United States served to unite these nationalities in support of the British government. For twenty years following the close of this war, government conditions in Canada were not satisfactory, and this led some of the French in Quebec to join in the Rebellion of 1837. This was headed in Upper Canada by William Lyon Mackenzie and in Lower Canada by Louis Papineau, who declared the purpose of the uprising to be to establish an independent Canadian nation.

At this time, about 1840, the population of Lower Canada was about 300,000, three-fourths of whom were French. In 1841 the provinces were united under one government and a Canadian Parliament of two houses was established, and this arrangement continued until the formation of the Confederation in 1867, when Quebec became a province of the Dominion of Canada.

Since Quebec became a member of the Dominion, its record has been one of progress and prosperity. The energies of the government have been devoted to the development of the natural resources of the province, the advancement of education, and the conservation of the political rights of the people in the Dominion



A TYPICAL FRENCH VILLAGE
Such communities are found throughout the eastern part of the province.

government. During the century and a half of their existence under British rule, the French-Canadians have been insistent upon retaining their native language and all social customs. There is a provincial organization for maintaining the purity of the French language In December, 1917, Quebec protested against conscription for the war, and offered to withdraw from the Dominion, which was naturally at once rejected.

Quebec has been unique in handling the prohibition question. The predominance of French population and the natural temperance of the people have caused them to resent arbitrary prohibition of a personal liberty. Quebec never enacted a prohibition law as did the other provinces, but there are government restrictions on the sale of liquor, wines, and beer. There are no bars, and most of the sales are made through government stores. There are provisions for the purchase of beer through grocers; hotels may secure wines and beers, and purchases may be received by mail. G.H.L.

Related Subjects. The reader who is interested in Quebec will find much information in the following articles in these volumes:

CITIES AND TOWNS

Montreal Quebec

LEADING PRODUCTS AND INDUSTRIES

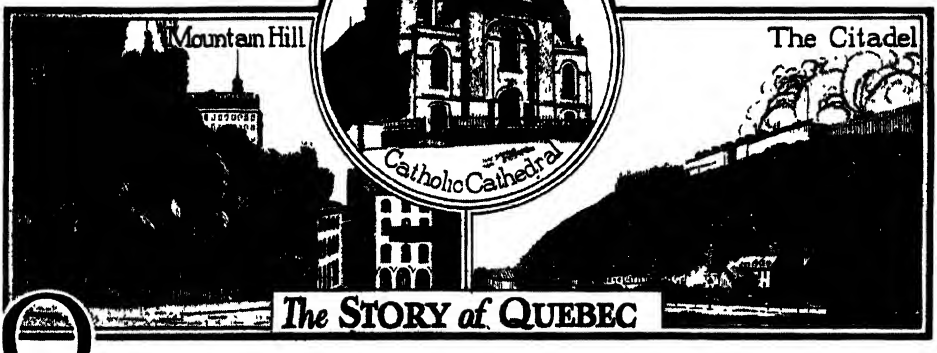
Apple
Asbestos
Butter
Cement
Cheese
Cod
Dairying
Fish
Hay
Herring
Lumber
Oats
Paper
Tobacco

WATERS

Chaudière
Memphremagog
Ottawa
Saguenay
Saint Lawrence

UNCLASSIFIED

Anticosti
Appalachian Mountains
Laurentian Plateau
Labrador
Quebec Act
United Empire Loyalists



The STORY of QUEBEC

QUEBEC. With its fortress, battlements, castles, monasteries, and crooked streets, this capital of the Canadian province of Quebec has the charm of a medieval city of Europe. It is the only walled city in North America, and its popular titles—"Cradle of New France" and "Gibraltar of America"—suggest at once its unique history and its impressive site. Quebec is located 173 miles northeast of Montreal, on Cape Diamond, a bold promontory at the confluence of the Saint Lawrence and Saint Charles rivers. It is the military station of Canada, and, with the exception of Gibraltar, once the strongest fortress in the British Empire. Among Canadian cities, it is seventh in size. Population 1921, 85,193. Nine-tenths of the people are French and Roman Catholic.

General Description. When approached from the river side, Quebec seems a huge mass of rock and citadel. Details come out one after another—the firm lines of rampart and bastion, the shelving outlines of Cape Diamond, Dufferin Terrace, the houses huddled at the foot of the rock, and the quays and docks.

Perhaps the finest view is from the Citadel on the summit of Cape Diamond, 340 feet above the river. Looking down over the city, one sees a strange confusion of buildings tumbling down to the shores as though cast at random by some giant hand. The tin roofs sparkle and blaze in the reflected light on a sunny day. Cape Diamond presents a precipitous front to the Saint Lawrence, but gradually slopes to the Saint Charles. The distance between the rivers across the ridge is rather more than a mile. Opposite the Cape, the Saint Lawrence narrows to a breadth of only 1,314 yards, but immediately below joins the gentle, meandering Saint Charles and forms an excellent harbor.

The Citadel. Fortifications enclose the Citadel, with its forty acres of parade ground. Canadian militia is stationed there in bomb-proof barracks loopholed for musketry. Powerful guns of modern construction command the land and water approaches to the city. The warlike aspects of this grim fortress are relieved by a tree-shaded esplanade, which joins two gates. Of the original six gates, only these two have been restored.

Upper Town. Around the Citadel is Upper Town, with the chief residences, public buildings, churches, gardens, and retail shops. The streets are broad, and street cars and automobiles are in evidence. Adjoining the Citadel, the famous Dufferin Terrace extends for about a quarter of a mile along the edge of the cliff.

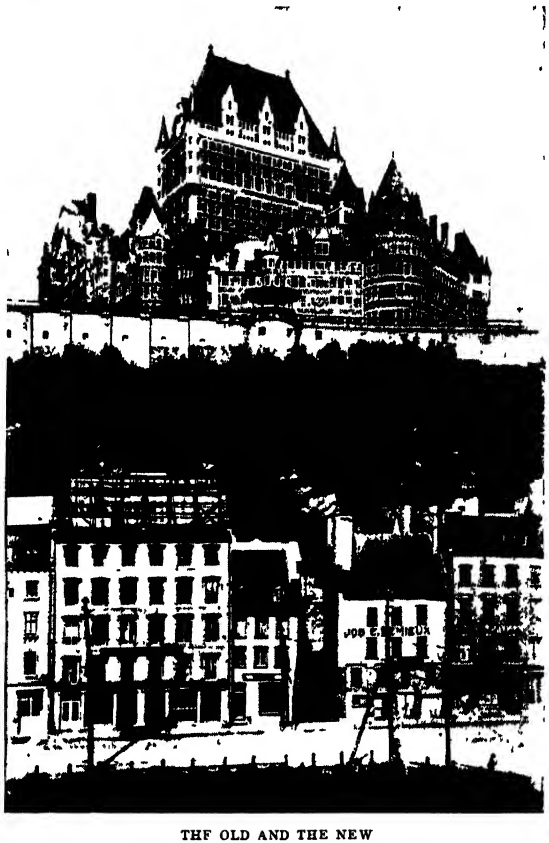
Lower Town, built around the base of Cape Diamond on a narrow strip of rocky ground, has the narrow, cobblestone streets of a French provincial town. Lack of sidewalks makes walking precarious, but shrewd citizens overcame the difficulty by building covered bridges between the houses. Built of stone or brick, these houses of two or three stories have steep roofs and dormer windows. Lower Town is the commercial section of the city. Modern roadways have been constructed between Upper Town and Lower Town, but far more picturesque were the steep steps, such as the famous Break Neck Steps, of a bygone era.

Buildings, Monuments, and Parks. The buildings of the provincial parliament and departments of the government are the most important public structures. The grounds are

adorned with monuments and statues reared to the memory of the heroes of a former age—to Cartier, Frontenac, Laval, Maisonneuve, Wolfe, Montcalm, and Levis.

Notable among the religious edifices are the Jewish Synagogue and the Anglican and Roman Catholic cathedrals. In the close of the English Cathedral is the spot where Cartier first assembled his followers on their arrival in the colony. Though not beautiful architecturally, the Roman Catholic Notre Dame des Victoires is interesting for its associations. Begun in 1688, it was named in gratitude for the repulse, by the French, of Sir William Phips' attack on Quebec (1690). The tomb of Montcalm is in the chapel of the Ursuline Convent Hotel Dieu Convent and Hospital, founded in 1693, has been modernized The old palace of the French Intendants is in ruins, but the extent of the original can be traced.

Laval University, with its triple towers and shining cupola, is one of the glories of Quebec. This fine educational institution, with its art gallery and libraries, represents the best of French culture in the New World.



THF OLD AND THE NEW

Above, Château Frontenac, below, the old part of town, below the hills.

Directly back of Dufferin Terrace is the Governor's Garden, a place of beautiful lawns and flower plots. It is dominated by a tall granite monument erected by the inhabitants to the memory of Wolfe and Montcalm, and bearing this inscription in Latin:

> Valor gave them a common death,
> History a common fame,
> And posterity a common monument.

East of the Terrace, and fronting on Place des Armes, is the picturesque Château Frontenac, one of the most complete modern hotels in America. It was built by the Canadian Pacific Railway after the plan of an old French château.

Commerce and Industry. Steamships unloading foreign cargoes and timid immigrants, or loading lumber; lake boats heavy with freight or crowded with tourists; and small passenger boats, used for sightseeing on the Saint Lawrence, line the wharves along the banks of both rivers during the summer months. Added to these are the ocean steamers that enjoy a brisk summer business in carrying tourists to Europe from Montreal as a starting point. It is not surprising that the water front is a busy one, for in the Quebec harbor the largest vessels can float at all times. Although winter navigation is impracticable, with drift ice floating back and forth with the tide, the city has an enormous foreign trade. The chief export is lumber, which was formerly rafted into the coves of the Saint Lawrence, but is now carried by rail. There is also a large foreign trade in cattle and grain.

It was discovered in 1911 that Montreal had displaced Quebec in importance as a port. Immediately, the latter city set about improving its commercial and industrial position by improving the harbor. One of the largest dry docks in the world was built here by the Dominion government at a cost of $7,000,000.

Another important factor in increasing the city's commercial importance was the completion, in 1917, of the famous bridge connecting the north and south shores of the Saint Lawrence. One of man's greatest engineering feats, it has a total length of 3,239 feet and a suspended span of 640 feet. The completion of the bridge made possible the running of six railways simultaneously into Quebec—the



Photo P & A

TOBOGANNING IN THE CITY OF QUEBEC

Canadian National and Canadian Pacific, and subsidiary lines. (See page 5911).

Industrial establishments include boot-and-shoe factories, tanneries, machine shops, steel and iron plants, printing and binding plants, and manufactories of wood pulp, food products, clothing, cigars, and cigarettes. Cheap electric power is supplied from the Shawinigan and Montmorency falls.

History. Jacques Cartier (which see) discovered the Indian village Stadacona, clustered about the foot of the bluff, when he sailed up the Saint Lawrence in 1535. Cartier erected a cross and took possession of the country for France.

In 1608, twelve years before the *Mayflower* touched the shores of Massachusetts, Samuel de Champlain (which see) founded a settlement, which he called Quebec. The English captured it in 1629, but it was restored to France in 1632. In 1663 it became the capital of the royal province of New France, which Louis XIV dreamed of expanding into a French and Catholic empire that should embrace the entire continent.

The French held possession of Quebec until 1759, although two attempts were made by the English to capture it. Sir William Phips, governor of Massachusetts, with a fleet and army fitted out in New England, was defeated by Frontenac in 1690, and a British expedition under Sir Hovenden Walker was shipwrecked in the Saint Lawrence in 1711. On September 18, 1759, five days after the Battle of the Plains of Abraham (see QUEBEC, BATTLE OF), Quebec was captured by the British, and was later ceded to Great Britain by the Treaty of Paris (1763).

The Americans suffered a disastrous defeat when they attempted to capture the city in 1775. General Montgomery, leader of the American troops, was killed, and Benedict Arnold was compelled to retreat in the following spring.



Photo Keystone

THE SAINT LAWRENCE RIVER AT QUEBEC

Quebec celebrated its Tercentenary in 1908. It remains, as always, a place of charm and interest for historian, student, and traveler. The near-by Plains of Abraham, now a public park with a monument marking the spot where General Wolfe fell; Wolfe's Cove, where the English landed for their attack; beautiful Montmorency Falls, Sainte Anne de Beaupré, with its relics, and other places of scenic or historic interest set Quebec apart as a city of distinctive quality. GHL

QUEBEC, BATTLE OF. This battle, fought between the French and the English on the Plains of Abraham, adjoining the city of Quebec, September 13, 1759, marks the turning point in the long struggle of the French and English for the possession of North America In 1759 William Pitt, Prime Minister of Great Britain, resolved to complete the conquest of the French in America and bring the French and Indian Wars to an end. He planned two campaigns. One, under Amherst, was to invade Canada by way of Lake Champlain and capture Fort Ticonderoga and Montreal; the other, under Wolfe, was to sail up the Saint Lawrence River and capture Quebec.

Early in June, Wolfe, with a trained army of 8,000 men, appeared before Quebec and began a siege of the city, which the French considered could not be taken by assault, since the high, steep promontory upon which the fortress was built made the fort inaccessible from the river, while the guns of the fort could sink any ship that attempted to pass them. For several miles on each side of the promontory on which Quebec is built, the north bank of the Saint Lawrence is high and steep. Along these

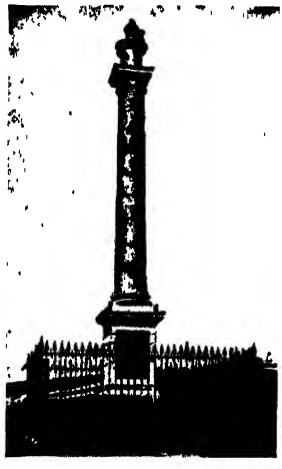


MAP OF BATTLEFIELD

heights the French forces under the command of Montcalm were stationed. Wolfe landed his army on the isle of Orleans, four miles below the city. He then sent a detachment to Point Levis on the south bank of the river directly opposite the Citadel. From these two points, the British bombarded the city with such success that the inhabitants were compelled to abandon their homes. The main fort, however, remained intact.

On July 31 the British made an attack on Beauport, which resulted in failure, but a detachment of the British forces encamped on the opposite side of the Montmorency, where

they remained until they were withdrawn for the final assault upon the city. Wolfe now conceived one of the most daring projects in military history. He would scale the heights in the night, and attack Montcalm in the rear. The plan was desperate. If it succeeded, Quebec would be won; if it failed, the British army would be destroyed.



BATTLE MONUMENT
On the Plains of Abraham

The most careful preparations were made. The time chosen was when there was no moon, and the bed of a little brook (then dry) was selected as the pathway up the ascent On the night of September 12, the British forces rowed to the designated point with muffled oars and began the ascent in single file. Before daybreak, Wolfe had drawn up his 3,600 men in battle array on the Plains of Abraham. The French were amazed, but Montcalm brought his forces to the attack in good order. The British officers, however, had commanded their men to reserve their fire until the enemy was within forty paces, and the first volley piled the ground with heaps of slain. The French line broke and fled, and all the efforts of their officers to rally them for a second attack were in vain. The battle was short, but Quebec was won. Both commanders lost their lives, but within a few days, the city surrendered to General Townshend, the British commander who succeeded General Wolfe.

With the fall of Quebec, the French lost all hope of retaining their American possessions, and at the Treaty of Paris, 1763, all of Canada was ceded to Great Britain. The Battle of Quebec, therefore, was one of the most important military events in American history. At the celebration of the Tercentenary of the founding of Quebec, in 1908, this field and the battle ground of Saint Foy were made into a national park and given the name *Battlefields National Park.*

Related Subjects. The reader is referred in these volumes to the following articles:

French and Indian Wars	Quebec (city)
Montcalm, Louis Joseph	Wolfe, James

QUEBEC ACT, an act passed by the British Parliament in 1774 for the purpose of organizing the government of Canada, which had been acquired from France in 1763, at the close of the French and Indian Wars. For ten years, affairs in the new possession were in a troubled state. The "new subjects," as the French-Canadians were called, desired to continue their "ancient customs and usages," particularly in the administration of justice. They were accustomed to trial by a judge without a jury, and to other features which the "old subjects," the English colonists, did not like. General discontent made a definite arrangement necessary, and in 1774 Parliament organized the province of Quebec.

The Quebec Act included three provisions which caused indignation among the English-speaking colonists. First, the province of Quebec was extended to the frontiers of New England, Pennsylvania, and New York provinces, the Ohio, and the left bank of the Mississippi, a section which the colonies on the Atlantic coast claimed by their original charters. Second, in this territory the act substituted French for English civil law. Third, the act withheld the privileges of representative government from the inhabitants.

The Quebec Act was justified in the eyes of its supporters by the arguments that most of the settlers in the Northwest Territory were French, and that they were not acquainted with, and did not want, English law and institutions. The English colonists, however, regarded the act as a blow at them and their desire for expansion. For this reason, the Quebec Act was one of the chief factors in stirring them to revolt. Even in England there was considerable resentment, and charges were publicly made that the interests of the English Protestant colonists were being sacrificed to those of the French Catholics. Parliament's desire to conciliate the French-Canadians was rewarded only a year later, when Quebec refused to join the English-speaking colonies to the south in their revolt against the mother country. See CANADA (History: After Britain's Conquest).

QUEBEC BRIDGE. See pages 949, 5911.

QUEBEC TERCENTENARY. See QUEBEC (History).

QUEBRACHO, *kay brah' cho,* a tree which is a valuable source of tannin. See PARAGUAY (Products).

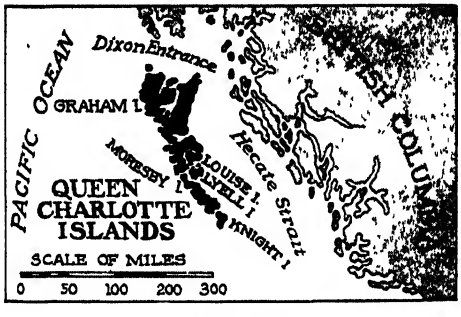
QUEEN, the title given to a woman who is the sovereign ruler of a state. Her official designation is *queen regnant.* The wife of a king is, by courtesy, addressed as queen, but her legal position is that of *queen consort.* The mother of a king is a *queen mother,* and the widow of a king is a *queen dowager.* The present form of the word is derived from the Old English *cwene.*

A queen regnant has every political right, duty, and obligation of a male sovereign. The queen consort is a subject of the king, but has

certain privileges not accorded other women of royal birth. In most countries under monarchical rule, her rights and liabilities and general political and legal status are the same as those of a woman who has no husband. Financial provision is made for her by law. The queen dowager has practically the same standing, privileges, and support as the queen consort, except that it is not high treason to conspire to put her to death, as is true of an attempt upon the life of a queen consort, because the succession to the throne is not endangered thereby. Such a crime is simply murder, as in cases affecting persons of less exalted stations.

QUEEN ANNE'S WAR. See FRENCH AND INDIAN WARS.

QUEEN CHARLOTTE, *shahr' lot*, ISLANDS, a small group of islands lying off the coast of British Columbia, and for governmental purposes a part of the province. Geologically, however, like Vancouver Island, 130 miles to the southeast, they are the remnants of an extinct mountain range which belonged to a different era from the mainland.



LOCATION MAP

Except on Graham Island, which is chiefly a rolling plain, the surface is mountainous in character, though it nowhere reaches an altitude of more than 5,000 or 5,500 feet. There are coal deposits of good quality, besides abundant timber and some minerals. Halibut-fishing in Hecate Strait, which separates the islands from the mainland, is a large industry, but is conducted chiefly from the mainland. The area is about 5,100 square miles.

The inhabitants, except for white settlers, are the survivors of the Haida tribe of Indians, now no more than 700 in number. This was the finest and most advanced of the Pacific coast tribes. It had developed Indian art to its highest degree; its carved totem poles are considered the most remarkable on the Pacific coast (see TOTEM). The islands were discovered by Captain Cook, about 1778, and were named by Captain Dixon, who visited them in 1787 in his ship, the *Queen Charlotte*, and claimed sovereignty for Great Britain.

QUEEN CITY OF THE ADRIATIC, a name applied to Venice (which see).

QUEEN OF HEARTS (poem). See LANGUAGE (Steps in the Study of Language: First Year).

QUEEN OF SHEBA. See ETHIOPIA; SOLOMON.

QUEENSBERRY, *kweenz' bur ie*, JOHN SHOLTO DOUGLAS, Marquis of (1844-1900), a widely known English patron of sport, especially of pugilism. He was but fourteen years of age when he succeeded to the title of marquis. The next year he joined the army, where he remained for five years, and from 1872 to 1880 represented Scotland in Parliament. Because of his interest in the sport, the new rules for prize fighting which he helped to formulate in 1867 were called the Queensberry Rules, and these are yet in use, though somewhat modified in details. See BOXING (Marquis of Queensberry Rules).

QUEENSLAND, *kweenz' land*, the second largest state of the Australian Commonwealth, ranking next to Western Australia. It occupies the entire northeastern part of the continent. Having an area of 670,500 square miles, it is more than one-fifth as large as Continental United States, and about three times the size of Manitoba. A wedge-shaped peninsula extends northward, enclosing the Gulf of Carpentaria, and the state has over 3,000 miles of seacoast. The Great Barrier Reef, a coral ridge off the east seacoast, extending for a distance of over 1,200 miles, encloses a broad, quiet bay, dotted with numerous islands and forming many fine harbors [see AUSTRALIA (Physical Features)].

For about 300 miles inland, the eastern section is rugged and mountainous, some of the wooded peaks rising more than 5,000 feet above the sea. The western section is a treeless, grass-covered plain, broken by a spur of mountains, and underlain by extensive coal beds. Queensland has many navigable rivers. Mangrove thickets and dense tropical forests, luxuriant with palms, pines, bamboo, and ferns, border these streams.



LOCATION MAP
Showing position of Queensland in the Commonwealth and the proportion of the continent occupied by it.

The climate is equable, and even in the arid sections, the temperature rarely rises above 95° F. The rainfall is abundant on the east coast, averaging 150 inches in the north. It decreases to twenty inches in the interior, and



Photo Commonwealth Immigration Office

TROPICAL BEAUTY IN QUEENSLAND

averages but six inches a year in the extreme west.

The People. The inhabitants number about 885,000, according to an estimate in 1928 The majority are Australian-born or are from the British Isles, the remainder chiefly Asiatics, Polynesians, and aborigines.

There is no State Church, but over one-third of the inhabitants are members of the Church of England. The Roman Catholics constitute the next largest religious body, followed by the Presbyterian, Methodist, and Lutheran denominations.

Primary education is free and compulsory, and the percentage of illiteracy is low. There are separate secondary schools for girls and boys, technical schools, a university at Brisbane, and many private institutions. Charitable institutions, including hospitals, asylums, and homes, are supported by a state endowment and public subscription.

Industries. In the eastern section, hundreds of artesian wells encourage large crops of hay, wheat, maize, and potatoes; and many varieties of tropical fruit, including bananas, pineapples, grapes, and oranges, are grown on the well-watered coast. Sugar cane, however, is the most important commercial crop, and considerable cotton is cultivated. Large flocks and herds are pastured in the arid, western plains, and dairying is a rapidly growing industry in the south. Queensland produces nearly one-half of the cattle of the Commonwealth. About ninety-four per cent of the total area of the land belongs to the Crown, and is leased for pastoral and agricultural purposes.

The mountains are rich in gold, silver, tin, copper, and bismuth, and the state promises to become important in the production of coal. There are large exports of gold, wool, meat, sugar, and hides; nearly all the needed manufactured articles are imported, the industries of the state being chiefly devoted to cotton and sugar manufacture, brewing, meat-packing, and tanning.

Government and History. The chief executive officer is a governor, appointed by the British government, who is assisted by an executive council of ten ministers. The legislative department consists of a parliament made up of the legislative assembly of seventy-two members, elected for three years. Woman suffrage prevails in Queensland, as in the other Australian states. The state is represented in the Commonwealth Parliament by ten Representatives and six Senators. Most of the railroads, which have a mileage of over 6,000, are controlled by the state.

Portuguese sailors in 1605 were probably the first Europeans to know this territory, and when Captain Cook came upon the region, in 1770, he took possession, calling it New South Wales. The first settlement was a penal colony established in 1826 on Moreton Bay. The convict population gradually disappeared, and attempts to reëstablish it were frustrated by the free inhabitants. In 1842 the region was

opened to free settlers only. In 1859 Queensland, which had been a part of New South Wales, was made a separate colony, in spite of the opposition of the mother colony. Seven years later, a financial crisis in which banks failed, London loans collapsed, and the government treasury became depleted, threw the country into a panic which might have crushed the people completely, had not rich gold fields been discovered the same year. Mining became the principal occupation, and the development of the country was general and rapid.

Cotton-raising for British textile mills became important during the American War of Secession, and once started, continued to prosper. Sugar-growing, for which coolies from the South Sea Islands were imported, flourished. Confederation with the Australian Commonwealth did not greatly concern the people, and they sent no representative to the convention at Melbourne. However, in 1899 the enabling act was passed, and when submitted to a referendum, later in the year, the Constitution for the new federation was ratified by a small majority.

Brisbane, *briz' bane*, the capital, is a city which originated in a convict settlement established in 1826 It was named after Sir Thomas Brisbane, a former governor of New South Wales, who was instrumental in removing the convict settlements and materially assisted in the development of the country

The city is well situated on the Brisbane River, near the Pacific coast, and is the chief seaport of Queensland Its commercial importance has increased rapidly, owing to the quick settlement of the surrounding country The chief industries are the manufacture of boots and shoes, and soap manufacturing; the city has numerous breweries and distilleries, and is an important center of the wool trade

Brisbane is a busy, prosperous city, clean and well planned, and is the seat of Queensland University, established in 1911. South Brisbane and suburbs were merged with the city in 1925, giving greater Brisbane an area of 385 square miles The population in 1927 was 274,260

QUEENSTON HEIGHTS, BATTLE OF. See WAR OF 1812.

QUEENSTOWN, now officially COBH, a city of the Irish Free State See IRELAND (The Cities).

QUELPAERT ISLAND. See CHOSEN

QUERCUS. See OAK (Scientific Names)

QUETTA, *kwet' ah*, the capital of Baluchistan (which see).

QUETZAL, OR **QUEZAL,** *ket sahl'*, or *ket' sal*, a brilliantly colored bird of the trogon family, found in Central America. It has a short neck, small, weak feet, a round crest, and enormous tail coverts, three and a half feet long. The upper part is bronze-green, the lower crimson. The female has no long tail coverts, and is colored brown and buff. The quetzal haunts the thickest parts of the forest, clinging to trees, like the woodpecker, but because of its weak feet, it is unable to walk or climb with ease. It is not shy and is very unsuspicious; the natives often kill the birds with clubs. The cry is two plaintive notes, swelling to a discordant scream. The bird builds no nest, but bores a hole in rotten stumps or trees. It lives chiefly on fruit, lizards, small crabs, and insects.



THE QUETZAL
It is a bird of freedom, and will not remain alive in captivity A legend states that, when captured, it will curl up and break its long, sweeping tail, and then die of grief

The quetzal is the national bird of Guatemala, and in ancient times, only chiefs were allowed to wear its feathers. See TROGON. D.L.

Scientific Name. Quetzals belong to the family *Trogonidae*. The species described is *Pharomacrus mocinno*.

QUETZALCOATL, *ket sahl ko ah' t'l*, a deity of the Aztecs. See AZTEC.

QUEUE, *ku*, the long hair of Chinamen, worn in a single braid. See CHINA [History: (Early Modern Period)].

QUICHUA, *ke choo' ah.* See INCA.

QUICK CONSUMPTION. See TUBERCULOSIS.

QUICK GRASS. See COUCH GRASS.

QUICKLIME. See LIME.

QUICKSAND, a mass of loose sand mixed with water to such an extent that it is incapable of supporting a heavy body. The grains of sand, which have smooth, rounded surfaces, do not cling together to form a compact mass. Quicksands are often formed in the mouths of rivers or in their channels, or on seacoasts. Some quicksand may be firm and dry for hours, but when it is wet, it becomes unstable and dangerous. Men and teams, as well as wild animals, have lost their lives by sinking in deep quicksands, which are not easily distinguished from ordinary sand, and so are often dangerous traps. Operating in quicksand is one of the difficult problems of engineering. One method of overcoming its instability consists in sinking into it pipes, through which a very cold brine is circulated, as a result of which the surrounding mass is frozen hard. Caissons are also used. See CAISSON. L.LaF.

QUICKSILVER. See MERCURY (metal).

QUILL. See FEATHER.

QUILLER-COUCH, *kwil' ur kooch'*, SIR ARTHUR THOMAS (1863-), an English novelist, essayist, and poet, well known under the pen name of "Q." He was born in Cornwall. After taking his degree at Trinity College, Oxford, where for a time he lectured on literature, he began his successful career as editor and writer. Establishing himself at first in London, in 1891 he left that city to reside at Fowey, Cornwall, a region which he has faithfully pictured in many of his writings. He was knighted in 1910, and two years later was appointed King Edward VII professor of English literature at Oxford.

His Literary Achievements. The first publications of Quiller-Couch were romances on the order of Stevenson's, and include *Dead Man's Rock*, *Troy Town*, and *The Splendid Spur*. Years later he was called upon to finish Stevenson's fascinating tale of *Saint Ives*, a task which needed his bright imagination and talent for vivid description Among later novels are *The Blue Pavilions*, *The Ship of Stars*, *Fort Amity*, and *News from the Duchy*. He also wrote short stories, volumes of poems and essays, and collected and edited two delightful anthologies of English poems—*The Golden Pomp* and *Oxford Book of English Verse*. Among his essays are *Adventure in Criticism*, *From a Cornish Window*, *On the Art of Writing*, and *On the Art of Reading*.

QUILL LAKES. See SASKATCHEWAN (Surface and Drainage).

QUINCE, *kwins*, a shrub or small tree of the rose family, which produces a fruit much used in making jellies and as a preserve. The tree, which is native to Asia, is now cultivated throughout Europe and in various parts of America. The fruit is golden-yellow and very hard, and in shape resembles both the apple and the pear, to which it is related. When fresh, it puckers the mouth, and is never eaten raw, but it has a delightful taste when cooked, and is a favorite flavoring in marmalade and other fruit preparations. In America, quinces may be raised as far north as New York; in that state are found the best orchards of any in the United States. The plant is propagated by cuttings. Some varieties are used as stock for dwarf varieties of pears (see PEAR). B.M.D.

Classification. The botanical name of the quince is *Pyrus cydonia*, family *Rosaceae*.

QUINCY, *kwin' sie*, ILL. See ILLINOIS (back of map).

QUINCY, *kwin' zie*, JOSIAH (1772-1864), an orator, lawyer, statesman, and educator, born in Boston and educated at Harvard College. In 1804 he was elected by the Federal party to the Massachusetts senate, and the next year he entered Congress. There, as an opponent of Jefferson's policies, he displayed such power as a fiery orator that he quickly became a Federalist leader in the House. As one of the first men in that body to denounce slavery, he feared the purchase of slave-holding Louisiana, and declared the act sufficient cause for disunion. This was the first declaration in Congress of the secession doctrine. In 1812 he was so enraged by the American declaration of war against Great Britain that he refused a reelection to Congress. In 1823 he began a notable career as mayor of Boston. Quincy accepted the presidency of Harvard University in 1829, and during the sixteen years of his administration, made extraordinary improvement in the school's equipment, methods, and standards.



Photo. Brown Bros.
JOSIAH QUINCY

QUINCY, MASS., a residential city in Norfolk County, situated on Quincy Bay, and separated from Boston by the Neponset River on the north, and from Weymouth by the Fore River on the south. The city has a fine system of parks, of which Merrymount and Faxon are the most important. Formerly the quarrying of granite was the chief industry, but within the last few years, manufacturing has greatly increased. Population, 1928, 67,600 (Federal estimate).

Transportation. Quincy is served by the New York, New Haven & Hartford Railroad and by interurban electric lines The first railroad in New England was built here in 1826, for carrying granite from the quarries to tide water The road was about four miles long, and the cars were drawn by horses

Industries. Aside from the large granite quarries, the city has iron and steel mills, shipyards, brass and iron works, and factories producing automatic weighing and packaging machines, tubular rivets, and foundry and electrical goods.

Institutions. Prominent features of the city include the Woodward Institute, an endowed high school for girls; and Crane Memorial Hall

History. The site of the present city was settled in 1625 as Mount Wollaston. Four years later, Thomas Morton gained control of the settlement and established the famous "New England Canaan," or "Merrymount." He instituted many practices against the wishes of the Pilgrims, and, not heeding remonstrances, was captured by Captain Miles Standish in 1628, and sent back to England. The settlement was a part of Braintree until 1792, when it was incorporated and named in honor of John Quincy. A city charter was granted in 1888. Quincy was the birthplace of two Presidents—John Adams and John Quincy Adams—and of John Hancock. G.A.W.

QUININE, *kwi' nine,* an exceedingly bitter medicine obtained by a secret process from the bark of certain trees (genus *Cinchona*) native to South America, but grown in India and other tropical countries. Quinine is chiefly valuable as a specific remedy for malaria. It also is effective in allaying fever, and is a nerve stimulant and general tonic through its power of increasing the flow of the digestive juices. Quinine solution injected into the rectum is a worm-expeller. In influenza, neuralgia, and headache, the drug is taken for the relief of pain. It is a common remedy for colds. Large doses cause ringing in the ears, dizziness, and pain in the head, and dangerously affect the blood pressure, even causing death, and the drug should be taken only as prescribed by a reliable physician.

Chemically, quinine is a compound of carbon, hydrogen, oxygen, and nitrogen. When pure, it forms silky, needle-like crystals that unite with acids to form salts That is, it is an alkaloid. Industrially, quinine is valued as an ingredient of hair tonics

Related Subjects. The reader is referred in these volumes to the following articles

Alkaloids	Malaria
Cinchona	Medicine and Drugs

QUINNOT, *kwin' at,* a species of salmon (which see).

QUINO. See PERU (History)

QUINSY, *kwin' zie,* a form of sore throat which usually results in the formation of an abscess in the region of the tonsils. One or both sides may be affected. It is caused by germ infection, following exposure to cold or dampness, and begins with chills, exhaustion, fever, and pain in the throat. As the disease progresses, the affected tonsil swells until swallowing and even opening the mouth become exceedingly difficult and painful. In severe cases, the patient has alternate chills and sweats, and at night becomes delirious. Though the ailment is not usually fatal, generally ending in from five to eight days with the bursting of the abscess, there are cases on record of death by suffocation, caused by the bursting of the abscess while the patient was asleep. If taken in time, an attack can often be promptly checked. The patient should rest quietly in bed, gargle the throat, and take purgatives. A developed case needs the attention of a reliable physician. Lancing the abscess, with draining of the pus, always brings immediate relief. Quinsy does not usually attack children or people past forty, but the same person may suffer from recurring attacks. It is generally advisable to remove diseased tonsils. See TONSIL. W.A.E.

QUINTE. See FENCING.

QUINTILIAN, *kwin til' ih an* (MARCUS FABIUS QUINTILIANUS) (about A.D. 35–about 97), a Roman rhetorician, born at Calagurris, in Spain. Information about his life is meager, but it is probable that his family removed to Rome while he was a boy, and that there he grew to manhood. After spending some years in Spain, he returned in 68 to Rome with Galba, and began to practice as an advocate. It was as the head of a school of oratory that he was best known, however, and Vespasian created for him a liberally endowed chair of rhetoric. He taught for about twenty years, and after his retirement spent two years in the composition of his great work—*De Institutione Oratoria,* an exhaustive system of rhetoric, dealing with the training of a would-be orator from infancy. Quintilian's literary judgments are most true and sympathetic, perhaps the best in ancient literary criticism. There are extant 164 declamations which are credited to Quintilian, but their authorship is by no means certain.

QUINTILIS. See JULY.

QUIPU, *ke' poo,* an element in Inca education. See PERU (History).

QUIRINAL, *kwir' ih nal,* or *kwih ri' nal,* a famous hill of ancient Rome, apart from the older City of the Seven Hills, but included in the area within the Servian Wall. Quirinus, the god in whose honor the hill is named, was the third most important of Roman deities, ranking next below Jupiter and Mars. On the hill, in the days of the city's ancient splendor, were the temple of Quirinus and the baths of Constantine and Diocletian. See ROME, for map; see, also, QUIRINUS.

Quirinal Palace, a palace in Rome, on the Quirinal Hill, which since 1870 has served as the residence of the kings of Italy. Previous to that time, it was a summer residence of the Popes, having been begun for that purpose by Gregory XIII in 1574. Noteworthy among the works of art which it contains is an *Annunciation* by Guido Reni.

QUIRINUS, *kwih ri' nus,* the name given in ancient Rome to a deity who held third place in the Pantheon; only Jupiter and Mars outranked him. At the time of the supremacy of Rome, there grew up a tradition that this god was Romulus in his deified state. Extraordinary honors were paid him, and his festival was on February 17. See PANTHEON.

QUIRITES, *kwih ri' teez,* a name applied to the citizens of ancient Rome with reference to their civil relations. It was distinguished from *Romani,* which was applied to the citizen body in connection with military and political affairs. It is supposed that *Quirites* was the original name of a tribe of the Sabines, and as both Romans and Sabines composed the nation, it was appropriate that the two terms should be used to designate its citizens.

QUITCLAIM. See DEED.

QUITO, *ke' toh.* See ECUADOR (The Cities).

QUITUS, an ancient kingdom. See ECUADOR.

QUIXOTE, DON. See DON QUIXOTE.

QUOITS, *kwoits*, a pastime resembling discus-throwing, and consisting in the tossing of iron rings, also called quoits, at a peg thrust into the ground. In America horseshoes are frequently substituted for quoits. The pegs are usually set thirteen yards apart. The quoits are eight inches in diameter, with a rim from one to two inches in breadth Each player pitches two quoits, and then yields his place to an opponent As many as desire may take part. The aim is to ring the peg with a quoit. A score of 11, 21, or 50, as may be agreed upon, constitutes a game. In a game of 11 or 21 points, a *ringer*, a quoit which encircles the peg, counts 3; a *leaner*, a quoit which leans against the peg, counts 1; and if there are no ringers or leaners, the nearest quoit counts 1. As the game is sometimes counted, a ringer scores 5, a leaner 3.

QUORUM, *kwo' rum.* In the organization of an assembly, a quorum is the number of members who must be present in order that the body may transact business legally.

In public bodies, the quorum is usually fixed by the constitution or by-laws. When the assembly is a representative body, performing the functions of government for a constituency, or when the body is of the nature of a board of managers, or trustees, carrying on the business of the corporation which elected them, a majority of the members usually is required to form a quorum, and no action of the members themselves can at any time change this requirement.

In the halls of probably every legislative body in the world, measures are debated when a quorum is not present, by general consent not to recognize the fact, but when the hour for voting is reached, a hurried call for absent members usually brings to their seats a number sufficient to give legality to the proceedings. See PARLIAMENTARY LAW.

QUOTATION, *kwo ta' shun*, **MARKS.** See PUNCTUATION.

QUOTIENT. See DIVISION.

QUO VADIS. See SIENKIEWICZ.

QUO WARRANTO, a Latin phrase meaning "by what authority." It is a writ or proceeding by which a court makes inquiry as to the right of an individual, company, or corporation to hold office or franchise, either not lawfully held or the right to which may have been forfeited by abuse or neglect.

THE WORLD BOOK
MODERN ENCYCLOPEDIA PICTORIAL
COMPREHENSIVE

Rr

R is the eighteenth letter of the English alphabet. The Phoenician letter from which it was derived was called *resh*, which meant *head*; in form it probably originally represented a head in profile. It was more like a *P* than an *R*, but was turned around with the projection to the left, and this upper part was angular instead of curved. The Greeks adopted the letter and made it precisely like a modern capital *P*, but the Romans added the extra line to distinguish it from the *P*, which with them assumed its present form.

In sound, *r* has always been practically what it is in English. It is a consonant, but has much of the character of a vowel, and is therefore classed with the semivowels. It closely resembles *l*, from which some peoples find it impossible to distinguish it; and the two have been frequently interchanged in the history of words. Theoretically, *r* is pronounced with a slight trilling sound; in reality, it is rarely so used in English except in singing. Many persons never pronounce an *r* unless it is followed by a vowel, sounding *far* almost as if it were spelled *fah*; but it always serves to modify somewhat the vowel sound which precedes it.

RA, the Egyptian god of the sun. See RE.

RABAT, *rah baht'*. See MOROCCO (The Cities).

RABBI, *rab' i*, a name of respect which the Jews applied to a doctor or teacher of the law. Another form of the word, and one denoting even greater respect, was *rabboni*. Neither of the words was used in Old Testament times, but they seem to have been in very general use at the time of Christ, for His Disciples often addressed Him by one of the two terms. In *John* 1, 38, the word *rabbi* is translated *master*. Rabbi is now the title of the minister or preacher in the present-day Jewish synagogue.

RABBINICAL PERIOD. See HEBREW LANGUAGE AND LITERATURE.



Photo: U & U

A WILD RABBIT BEING FED FROM A BOTTLE

RABBIT, *rab' it*, an interesting representative of the rodent group (the gnawing animals). The wild rabbit is a native of Europe, but domesticated species are found in most parts of the world. Rabbits belong to the same family as the hare, and in America the two names are often, though incorrectly, used interchangeably (see HARE). The "jack rabbit" has no right to its name, as it is a hare, while the "Belgian hare" is a rabbit.

Rabbits differ from hares in appearance, in that they are smaller and have shorter ears and legs; they differ in habits, in being less fleet, in living in colonies in underground burrows, called *warrens*, and in giving birth to blind, almost hairless, young. Like hares, they multiply rapidly, breeding several times



Photo U & U

ON THE ALERT, READY TO FLEE FOR HIS LIFE

Nature photography is an art Here is a rare picture caught by the camera A wild rabbit in its nest, ears back and nose quivering, feels safe only when no noises are heard

a year. They begin breeding at the age of six months, and produce five to eight young at a birth. Tender grass, clover, lettuce, cabbage, and bark of young trees are favorite foods. Great damage is often wrought by hungry rabbits, and in Australia and New Zealand, they have increased so rapidly as to become pests. There the farmers protect their crops with specially made wire fences. The favorite haunts of the rabbit are hillsides and sandy heaths. Its means of protection from its enemies are keenness of scent and hearing and fleetness of foot.

Native rabbit fur is soft and fine, and of a nearly uniform brownish color. That of some species turns white in winter. In its natural white state, or dyed in a variety of colors, rabbit fur is an important item in the fur trade (see FUR AND FUR TRADE). It is marketed under numerous trade names, including Baltic leopard, Arctic seal, beaverette, chinchillette, cony, electric beaver, electric mole, electric seal, erminette, French chinchilla, sealine, etc., etc. The skin, cleared of hair, is used with other skins to make glue and size. Rabbit flesh, cooked in stews or fried, is a palatable food.

Domesticated Rabbits. The texture of rabbit fur has been changed through domestication, and in ten distinct varieties, the color varies from white to black. Changes in the appearance of the ears have also developed, some being small, erect, and stiff, and others broad, soft, and hanging. The following are the more important kinds of domesticated rabbits:

Belgian Hare. This is one of the best-known varieties in America, and it is a true rabbit. It is a large animal, weighing about ten pounds, and has a broad head which tapers to the nose; the long ears are thin and translucent, and the eyes are bright brown. This rabbit is easily raised, and its flesh is considered excellent.

Lop-Eared Rabbit. This rabbit, distinguished by its long ears, which are about twelve inches in length, is the oldest fancy variety. It requires much careful attention.

Dutch Rabbit. This rabbit, which weighs only four pounds, is one of the smallest of domestic rabbits. It is hardy and beautifully colored, the fur being a combination of white and of black, blue, or lemon.

Angora Rabbit. Like Angora goats and cats, the Angora rabbit has a silky coat of white hair about six inches long, which can be cut and woven. This breed is also hardy.

Other Kinds. These include the dark, silky-haired *Siberian*; the *Himalayan*, valued for its skin, which closely resembles ermine; the large *Patagonian* and *Flemish* rabbits; the fancy *silvertip*; and the delicate white *Pole*, weighing only three pounds.



IN THE WINTER HOME

Care of Rabbit Pets. One must always handle a *bunny* very carefully, for the body bones are delicate, especially in the young. Grasp firmly the loose fur at the base of the ears with one hand, and with the other hand hold up the lower body, in this way easing the strain. If secured when over six weeks old, the rabbits can feed themselves. A little bran, mixed with hot water or hot milk, and a pinch of salt should be given them two or three times a day. Occasionally, they may have turnip tops, cabbage, lettuce leaves, or carrots, of which they are very fond. Too much vegetable food, however, will make them sickly. After they are six months old, they should have a larger proportion of dry food. Oats given once a day, fresh water daily, a few baked potatoes, or some clover for a change, will keep them in good health. They must be allowed to run about and exercise at least once a day, and careful watch must then be kept that cats, rats, or dogs do not attack them. W.N.H.

Scientific Names. Rabbits are included with hares in the family *Leporidae*. The domesticated rabbit is *Oryctolagus cuniculus*.

RABBONI. See RABBI.

RABELAIS, *rah b'leh'*, FRANÇOIS (about 1490-1553), a French humorist and satirist, one of the greatest literary figures in France during the sixteenth century. His most celebrated work, *Gargantua and Pantagruel*, is one of the earliest masterpieces of French prose. It relates the adventures of Gargantua, a giant with an enormous appetite, whose gluttony had made him notorious, and the amazing deeds of Pantagruel, the "king of drunkards." The work is a mingling of pure banter and keen and witty ridicule of politics, the Church, and education as they existed in the author's day.



Photo Brown Bros.

RABELAIS

Rabelais was by turns priest, physician, and story-teller. He was born at Chinon, the son of an apothecary, and was educated in the monastery schools. He joined the Franciscan Order and became a priest, but his ardent pursuit of the Hebrew, Arabic, and Greek and Roman classics offended his brother monks, and after living for a time in the abbey of the Benedictines, he gave up monastic life. In 1530 he began the study of medicine at Montpellier, where, in 1537, he was granted a doctor's de-

gree. In the meantime, he was appointed head physician of the great charity hospital at Lyons, a position which he held until about 1530. For a short time, he found it expedient to remain away from France, and in the interval, he became physician to the town of Metz. Shortly before his death, he served as curate in the parish of Meudon.

RABIES, *ra' bih eez.* See HYDROPHOBIA.

RACCOON, *rak koon'*, OR **COON,** the common names of a family of interesting little animals related to the bears. With the exception of one genus, all of the raccoons are found in the two Americas. The *common raccoon* is about thirty-two inches long from nose to end of tail, and weighs from twenty to twenty-five pounds. The stout body is covered with long, coarse hair, which is grayish and black-tipped. The tail is bushy, grayish-white, with definite rings of black. A coon's face, with its sharp, delicate nose, and patch of black around each eye, set off by surrounding whitish hairs, is foxlike and has a look of cunning, quite in keeping with its mischievous nature. These animals are famous tree-climbers, having long legs and strong claws. Their favorite haunts are hollow trees, and in cold climates they hibernate in such woodland homes (see HIBERNATION). Although, like bears, coons eat almost anything which comes their way, frogs, crabs, turtles, and other water animals are favorite articles of diet, and juicy corn crops are often ruined by visits from these greedy visitors. They always wash their food before eating it, and are fond of paddling in water. Robbing birds' nests and raiding chicken coops are perhaps their worst faults. From three to six young are born at one time, usually in April or May. They are blind and helpless at first, and are cared for by the parents for at least a season. The cry of the young resembles that of human babies.



Photo: Visual Education Service

FAVORITE RESTING PLACES

Coons are easily tamed and are amusing pets. In the Southern states, coon hunts on moonlight nights are a favorite sport. Roasted raccoon flesh is there considered a great delicacy, especially by the negroes. In colonial days, sleigh robes, overcoats, and caps of coonskin were popular, and the fur is still used extensively for coats.

The *agouara*, or crab-eating raccoon, is found in South America. A Himalayan species is called *panda*, or *coon-bear*.

From 1838 to 1844, the raccoon was the emblem of the Whig party in the United States, and members of that party were popularly called *coons*. The famous log cabins of the Harrison and Tyler campaign of 1840 always had coonskins nailed to the exterior. (See next page) M.J.H.

Scientific Names. Raccoons constitute the family *Procyonidae* The common raccoon is *Procyon lotor.* The agouara is *P cancrivorus* The Himalayan genus is *Aelurus.*

RACCOON MOUNTAINS. See ALABAMA (The Land).

RACE, any trial of speed among contestants, such as running, rowing, swimming, riding, and driving. Since the days when the prehistoric peoples escaped the cave bear by fleetness of foot, contests of speed of both men and animals have continued to excite the keenest interest. The successful runner in the Greek games was crowned with a wreath of laurel, and was honored by all the people. The games at Rome were not less popular. In modern times, such contests are a regular part of the rivalry among colleges, especially in America. The Olympian Games, held to-day as in ancient times, include many races, among them the famous Marathon.

With the invention of mechanical devices for increasing the speed with which man is able to propel himself, bicycle, motorcycle, and automobile races were added to trotting, pacing, and running races as popular diversions. Of these, the automobile race is the most thrilling, because of the very great speed attained by expert drivers. Yachting and rowing races have their enthusiastic followers, but they can



Photo. White World

At Home in a Zoo. A trio of well-fed raccoons in the Franklin Park Zoo, Boston, Mass.

hardly be called popular sports. Bicycle racing was once almost a rival of horse racing in America, but is very little followed now except in contests on prepared courses in large buildings, continuing for six days without interruption. Records of 2,365 miles for winning teams have been earned.

Whippet racing and the breeding of these small greyhound-like dogs have long been common in English country districts. In recent years, they have become more widely popular in England and the United States, although the betting which accompanies the races has caused them to be prohibited in some cities.

Horse racing itself, once called "the sport of kings," fell upon evil days as a result of the demoralization that came from the betting ring. Races frequently were "fixed," that is, arranged between owners; and when the public came to understand that it was not always permitted to see the best horse win, interest declined, and stringent laws against betting and racing caused the closing of many race tracks throughout the country. However, the American tradition of the turf is a fine one, for American breeders produced some of the swiftest animals on the track in the days when racing was at its cleanest and best. Horses are matched in trotting, pacing, and running races, and are further divided into classes corresponding to their speed.

Speed Records by Horses. The harness race was developed in America, and the early trotters and pacers of the United States had no equals. In harness races, the mile has been the standard distance, and the time was lowered from a little more than three minutes at the time of the death of the first great trotter, "Imported Messenger," in 1808, to 2:08¾ in 1884. The latter record was made by one of the greatest of American harness horses, "Maud S," in competition with her equally great rival, "Jay Eye See." The introduction of ball-bearing axles and pneumatic tires a little later was an important mechanical aid to speed, and its effect has been shown in still lower records for the mile. "Lou Dillon," a comparatively unknown mare, was the first horse to trot a mile in two minutes, in an exhibition mile behind pacemakers. The fastest time for a trotter was 1:54½, by "Uhlan," at Lexington, Ky., in 1913. "Dan Patch" established the pacing record of 1:55 for one mile at Saint Paul in 1906. The best running record for a mile is 1:35⅜, established by "Cherry Pie," at Belmont Park, N. Y., in 1923. In England running races have always been more popular than harness races, and one of the greatest turf events of the world for many years has been the English Derby, run at Epsom, near London.

In spite of restricting laws, the popular interest in racing has established the sport in many places in the United States. Probably the most famous race is the annual Kentucky Derby at Louisville. Belmont Park, N. Y., the Lincoln Fields, Washington Park, and Arlington tracks near Chicago are the scenes of other famous races. Immense stakes are won, which in one case amounted to more than $90,000 for the winner.

Automobile Races. Quite the most thrilling of modern spectacles are automobile contests, on speedways or country courses. They are international in character, and attract the most expert drivers of the world. Courage and staying power, together with exceptional presence of mind and constant alertness, are absolutely necessary to the driver's safety in his headlong flight over such courses as are run for the French Grand Prix, the Vanderbilt Cup, and the Speedway cups at Indianapolis. Great distances are covered in these races; the pace for the mile is less regarded than the ability of a driver to maintain a terrific speed for hundreds of miles. Records established on American speedways for 100, 400, and 500 miles are 44 minutes 52.4 seconds; 4 hours 4 minutes and 39 seconds; and 4 hours 56 minutes and 39.46 seconds, respectively. The world's record for a twenty-five-mile run was established in 1926 by McDonogh in 10 minutes 58.90 seconds. The world's speed record of 231.36 miles an hour was made by Major H. O. D. Seagrave in the *Golden Arrow*, on the course at Daytona Beach, Fla., in 1929. Competition among builders, who wish the honor of placing a winning car in the great races of the year, is scarcely less keen than among drivers, since the advertising value is clearly recognized. The amount of money spent on automobile racing is now an enormous sum, and its popularity appears to be growing, in spite of the fatalities that are too often a result of the terrific pace maintained.

Related Subjects. The reader is referred in these volumes to the following articles

Athletics	Motorcycle
Automobile	Olympian Games
Bicycle	Whippet
Laurel	Yacht and Yachting

RACEME, *ra seem'*, in botany, a type of flower cluster in which the flowers are borne on short, branching stems, or *pedicels*, on an elongated axis, or *peduncle*. There is no definite number of flowers, because the blooms appear as the axis lengthens, and the latter is not ended by a terminal blossom. Such a form of flowering is called *indeterminate inflorescence* (see INFLORESCENCE). The pedicels are borne in the axils of small modified leaves called *bracts* (see BRACT, for illustration). The red currant and lily of the valley are good examples of plants having *racemose* flower clusters. B.M.D.

The RACES of MEN



RACES OF MEN. The origin of man, the time of his advent upon the earth, and the manner in which the different races of men came into existence are questions that have always interested the world. Notwithstanding the fact that some of the most noted scientists of the last two centuries have devoted much time to the study of these questions, none of them is settled. Any estimate of the length of time that man has lived upon the earth is a mere hazard, as is seen by comparing the estimates of different authorities upon the subject, which vary from 10,000 to several hundred thousand years. All that can be said about the time is that it is very long, and it can be estimated only by tens of thousands of years.

There are two theories concerning the origin of man. The first is that he was a special creation, as explained in the first chapter of *Genesis*. For centuries, no other theory was considered by the Christian world, and this theory is still widely held. The second theory is that man sprang from the order of Primates, to which the apes belong, and has reached his present state through long ages of development.

The question of the division of mankind into races is also one concerning which there is a wide difference of opinion. These differences arise from the extreme difficulty of arriving at a common basis of classification. An old classification divided the races into the Hamitic, the Semitic, and the Japhetic. Another classification, and the one with which most of us are familiar, is that which is based chiefly upon the color of the skin, but also takes into consideration the shape and size of the head and the peculiarities of the features. This classification divided mankind into four races—the Caucasian, or white; the Mongolian, or yellow; the Malay, or brown; and the Negro, or black. To these Blumenbach added the red, or American, race.

Recent investigation and discoveries by anthropologists have caused many of them to set this classification aside in favor of one based upon a consideration of the color and form of the hair, form of the head, form of the nose, color of the skin, and stature. This classification, known as Deniker's, divides the human race into six groups and twenty-nine races, as follows:

I. Woolly Hair, Broad Nose
  1. Bushman
  2. Negrito
  3. Negro
  4. Melanesian
II. Curly or Wavy Hair
  5. Ethiopian
  6. Australian
  7. Dravidian
  8. Assyroid
III. Wavy Brown or Black Hair, Dark Eyes
  9. Indo-Afghan
  10. Arab or Semite
  11. Berber
  12. Littoral European
  13. Ibero-insular
  14. Western European
  15. Adriatic
IV. Fair, Wavy or Straight Hair, Light Eyes
  16. Northern European
  17. Eastern European
V. Straight or Wavy Hair, Dark Eyes
  18. Ainu
  19 Polynesian
  20. Indonesian
  21 South American
VI. Straight Hair
  22. North American
  23 Central American
  24. Patagonian
  25. Eskimo
  26. Lapp
  27. Ugrian
  28. Turkish or Turco-Tatar
  29 Mongol

Population of the Earth According to Race

RACE	LOCATION	NUMBER
Indo-Germanic or Aryan (white)	Europe, America, Persia, India, Australia	821,000,000
Mongolian or Turanian (yellow and brown)	Asia	645,000,000
Semitic (white)	Africa, Arabia, etc	75,000,000
Negro and Bantu (black)	Africa	139,000,000
Malay and Polynesian (brown)	Australasia	40,000,000
American Indian, North and South (red and half-breeds)		28,000,000
Total		1,748,000,000

Related Subjects. The reader who is interested in the details of this subject is referred in these volumes to the following articles

Anthropology (with list of peoples)	Ethnology
Archaeology	Evolution (Lines of Evidence)
Ethnography	Geology

RACHEL, *ra shel'* (1821-1858), one of the greatest of French tragic actresses, was born in Switzerland of Jewish parents. Her real name was ELISABETH RACHEL-FÉLIX. She began her career at the age of four, singing on the streets of Lyons. Five years later, the director of a music school heard her on the Paris streets and gave her lessons. However, she soon lost her singing voice, and began to study dramatics with Saint-Aulaire, then at the Paris Conservatory. Rachel's first professional appearance, in 1838, excited no great attention, but a year later, in the *Horace* of Corneille, she won a gratifying success. In 1855 she toured the United States, but her voice was impaired. Three years later, she died of tuberculosis, and

was buried in the Jewish section of Père Lachaise, the most famous cemetery of Paris.

Her best rôles were always those in plays of Racine and Corneille, and her interpretation



ELISABETH RACHEL FÉLIX

of the leading part in Racine's *Phèdre* has never been surpassed. Within her special range—the portrayal of human suffering—Rachel has, perhaps, never had a rival.

RACHEL, *ra' chel,* the favorite wife of Jacob. To win her he served her father (Laban) seven years, "and they seemed unto him but a few days for the love he had to her" (*Genesis* XXIX, 20). Offered Leah in her stead, Jacob had to serve Laban seven more years. Rachel's elder son was Joseph, beloved above his brethren; her younger son was Benjamin, "the little one," born in the last stages of the family's long journey from Mesopotamia to Canaan. After the birth of Benjamin, Rachel died. She was considered the tribal mother of the northern tribes of Israel, and when they were carried into captivity, she was represented as being inconsolable in her grief (*Jeremiah* XXXI, 15). This passage is quoted (*Matthew* II, 18) in the account of the murder of the innocents by Herod:

In Rama was there a voice heard,
Lamentation, and weeping, and great mourning,
Rachel weeping for her children,
And would not be comforted, because they are not.

Related Subjects. The reader is directed to the Biblical references above, to the illustration on page 5933, and to the following articles in these volumes:

Benjamin Jacob Joseph

RACHMANINOV, *rahk mahn' in ov,* SERGEI (1873-), a Russian composer and pianist, born in Novgorod of noble parentage. The loss of the family fortunes changed the plans that destined him for an aristocratic education, and at the age of nine, he began his musical training in the Saint Petersburg (now Leningrad) Conservatory. So great was his talent that he could have been a child prodigy had not his family preferred that he continue his studies.

In 1885, having been transferred to the Moscow Conservatory, the boy came under the influence of Tschaikovsky, Arensky, and Scriabine. He won the gold medal for composition with his one-act opera, *Aleko,* in 1892, and one year later was appointed professor of pianoforte in Maryinsky Institute, Moscow. The season of 1897-1898, he directed the private opera in Moscow, and the following season appeared in London at one of the Royal Philharmonic concerts.

Rachmaninov lived in Dresden for a few years, visited Paris in 1907, and made his first tour of the United States in 1910-1911. He then returned to Russia until 1917. Since 1918 he has spent much of his time in the United States, but has revisited Europe on concert tours His playing reveals an earnest, sober-minded musician, who always interprets the composer sincerely. His own compositions follow his theory that melody is music.

Notable Compositions. Rachmaninov's compositions include the famous *Prelude in C Sharp Minor,* which is the most popular among all his works, *The Elegiac Trio* for piano, violin, and violoncello, composed in memory of Tschaikovsky, the symphonic poem, *The Island of Death, The Bells,* based on Edgar Allan Poe's poem, *Spring,* for chorus and orchestra; and two one-act operas, *The Avaricious Knight* and *Francesca da Rimini.*

RACINE, *ra seen',* JEAN BAPTISTE (1639-1699), one of the foremost writers of poetic French drama. He was preeminently a tragedian, and the presentation, in 1667, of *Andromaque,* the first of his seven masterpieces of tragedy, was an event of great moment in the history of the French drama. Racine was born at La Ferté-Milon, and received a good education. The outstanding features of his college days were the religious impressions he received from his puritanic teachers and the thoroughness with which he studied the Greek classics. Sophocles and Euripides were to him the ideal dramatists. In 1662 he settled in Paris, was presented to the king, and became a poet of the fashionable element. At the same time, he formed friendships with Boileau, Molière, and other notables in the literary world.

In his later years, Racine refrained from writing for the stage, partly because he was incensed at the criticism of a hostile theatrical clique, and partly from religious motives. He was primarily a poet of the cultured and



Photo: U & U

THE TOMB OF RACHEL

Natives reverently visit this historic spot Modern clothing and customs have little influence over these descendants of Biblical people. (See page 5932)

fastidious; he never appealed to the masses. The dramatic element always stands out clearly in his plays, and character portrayal is subordinate to the development of the plot.

Notable Works. Racine's great tragedies, *Andromaque, Britannicus, Bérénice, Bajazet, Mithridate, Iphigénie,* and *Phèdre,* were produced between 1667 and 1677 *Esther* and *Athalie,* two Biblical dramatic poems, were written several years afterward, but neither was given to the public until after his death.

RACINE, WIS., the county seat of Racine County, is situated in the southeastern corner of the state, on Lake Michigan, at the mouth of the Root River. Next to Milwaukee, it is the leading manufacturing city in the state. It was founded in 1834, incorporated in 1843, and became a city in 1848. Population, 1928, 74,400 (Federal estimate).

Racine is one of the very few cities in the United States to have a Junior Police, under the direct supervision of the regular police department. These boys have equal power with the city police, and direct traffic past the schools whenever they are not in session. The junior police is under the merit system, and the captain and officers are chosen from the schools on the basis of scholarship and deportment.

Transportation. Racine is twenty-four miles south of Milwaukee and sixty-five miles north of Chicago, on the Chicago & North Western and the Chicago, Milwaukee, Saint Paul & Pacific railroads, and on interurban and motorbus lines. The harbor is good, and the city has steamship lines to other lake ports.

Industry. There are more than 175 factories, producing automobiles, thrashing machines and other farm implements, automobile parts, malted milk, electrical supplies, foundry and machine-shop products, leather, boots and shoes, trunks and valises, hardware, and lumber products. L.N.B.

RACK, an ancient instrument of torture, used to extort confessions from criminals and heretics. It was an oblong wooden frame with rollers on each end. Bound on this frame, the victim had questions put to him; if he remained stubborn and refused to answer, the rollers were gradually turned by means of levers, stretching the victim until the joints became dislocated.

The rack was used by the Romans, especially for torture of Christians, and was frequently employed during the Inquisition. Its use was introduced into England in 1447, but in 1628 its legality was contested, and the instrument fell into disuse.

RADCLIFFE, ANN. See HARVARD UNIVERSITY (Radcliffe College).

RADCLIFFE COLLEGE. See HARVARD UNIVERSITY, subhead.

RADIANT ENERGY. See LIGHT.

RADIATION. See HEAT (How Heat Travels).

RADICAL, in chemistry, two or more atoms forming a group which is capable of entering into a series of compounds without undergoing change. See CHEMISTRY.

RADICALISM, *rad' ih kah liz'm,* a term applied to the principles held by those who are opposed to conservative thought and action. It has been used in political terminology in England since the early part of the nineteenth century, but radicalism as a movement in English politics had its origin as early as 1769, in an effort to liberalize the House of Commons. At present, the British Labour party is considered a radical organization by the Conservatives, while the Labour party regards the Russian communists as the exponents of true radicalism. In the United States Senate, the term radical is often applied to the progressives, or insurgents, who have been in opposition to the regular Republicans through several administrations. In general, the name radicalism may be said to have a relative significance, for the radicals of one generation advocate the policies that the next generation accepts as a matter of course. Woman suffrage, the direct primary, and the initiative and referendum were all considered radical measures when first advocated. In world politics, the adherents of communism, or Bolshevism, best deserve the designation. See BOLSHEVIKI.

RADICAL SIGN. See SQUARE ROOT.

RADIOACTIVITY, *ra' dih o ak tiv' ih tie,* the property possessed by certain substances which causes them to emit rays capable of penetrating opaque substances. After the discovery of the X-ray, in 1895, physicists began experimenting with a number of substances to ascertain whether or not they possessed this remarkable form of energy, and in 1896 Henri Becquerel, a French scientist, discovered that the salts of uranium give off radiations that affect a photographic plate. The rays were named *Becquerel* rays, and the power of emitting them was called *radioactivity.* Two years later, Professor and Madame Curie announced their epoch-making discovery of an elementary substance which they found in pitchblende. The new element was named *radium,* because of its intense radioactive power. Its effects are told in these volumes under the title RADIUM.

There is no more amazing story in all science than the known facts about radioactivity. In the days of the alchemists, it was the dream of these investigators to change the baser metals, such as lead, into gold. With the development of modern chemistry, it became an accepted belief that one element cannot be changed into another, because, according to the older theory, elements are composed of one kind of atom, and atoms are indivisible. Radioactivity is the contradiction of this theory. Scientists now tell us that the atoms in radioactive substances are constantly breaking up, and in the process, the disintegrating element changes into a different substance. Radium is the offspring, so to speak, of uranium; it is the sixth product in a long process of disintegration, lasting millions of years, a process that has been traced as far down as lead. There is another series in which the parent element is thorium, and a third series derived from actinium. The transmutation of one element into another is being attempted by several scientists in laboratories. A number of individual successes have been reported, notably the production of hydrogen from various other elements. See CHEMISTRY (Transmutation of Elements).

Three types of rays are emitted by radioactive substances, though not all of them are projected by every such substance. These rays have been named *alpha, beta,* and *gamma,* the first three letters of the Greek alphabet. The alpha rays are positively charged atoms of helium gas, which move with an average speed of about one-fifteenth that of light, or 12,000 miles per second. They have low penetrating power. Beta rays are negatively charged electrons and are identical with cathode rays. Their velocities vary from about one-tenth to nearly that of light, and they are capable of penetrating three millimeters of aluminum. The gamma rays have practically the speed of light, or 186,300 miles per second, in round numbers. The gamma emanations are not particles of matter, but are electromagnetic pulsations like X-rays, though of shorter wave-lengths. They have high penetrating power, and have been known to pass through twenty centimeters of lead. The only known radiations of shorter wave-length are the so-called *cosmic rays,* of inconceivably intense penetrating power, generated in space. The effects of these rays are known through their influence on electroscopes. If these emanations should reach the earth with full penetrating power, they would destroy all life upon it.

A.L.F.

Related Subjects. Many other important and interesting facts related to radioactivity are told in the articles listed below.

Alchemy	Electricity
Atom	Marconi, Guglielmo
Cathode Rays	Matter
Chemistry	Millikan, R. A.
Cosmic Rays	Radium
Crookes Tubes	Roentgen Rays
Curie, Pierre and Marie	Uranium

RADIO COMMISSION. See RADIO COMMUNICATION; COOLIDGE, CALVIN.



The STORY of RADIO

RADIO COMMUNICATION. The legendary account of the birth of Minerva, Roman goddess of wisdom—how she sprang full grown from the head of Jupiter, clad in shining armor and singing a song of triumph—reminds one of the advent of radio, so rapidly has it become a part of modern life. Early in the present century, the world began to be thrilled by stories of rescues at sea, made vivid by accounts of appeals for help carried far over the ocean waste, and of responses received from out the darkness and storm, almost as if thought were being transmitted through the air. The wireless telegraph, which made these rescues possible, had been a factor in world communication less than two decades when the wireless telephone proved its worth in the World War. In 1919 large numbers of American service men trained in radio telephony returned home to build sets of their own, and to introduce the sport of amateur broadcasting. In 1920 Harding's election to the Presidency of the United States was announced from America's first professional broadcasting station, KDKA; then, almost before one could realize it, radio telephony took the public by storm, and the night of the Presidential election of 1924, millions of listeners heard, in their own homes, the news of Coolidge's victory.

Radio is one of the most fascinating discoveries of all time. We are too close to its beginnings and development to have lost the feeling of wonder at the daily occurrence of instantaneous communication between far-distant points. Radio remains for us the eternal miracle, but it is none the less the expression, the outgrowth, of a very old desire. From earliest times, men have sought to carry on rapid communication with one another. Nearly 500 years before the Christian Era, a swift-footed runner, Pheidippides, carried the news of the victory of Marathon to the waiting Athenians. He ran twenty miles, gasped out his message, and fell dead. How many school children of a generation ago thrilled to the recital of that story! How many of them must have lived to read the daily reports of a dirigible that encircled the globe in 1929! To people in countless towns and cities the world over, the progress of the *Graf Zeppelin* was revealed at frequent intervals by radio, during the magnificent flight of twenty-one days (elapsed time).

Between the running Pheidippides, who died of exhaustion, and the radio apparatus of a globe-encircling airship, there is a tale of centuries of human effort to achieve rapid communication. We read in the *Iliad* of beacon fires kindled on successive mountain tops, to tell the Greeks that Troy had fallen. Signal towers on the Great Wall of China; relays of couriers, used by the Greeks and Romans; shouting sentinels of ancient Persia and of Gaul; flashes from Persian battle shields; smoke rings and fire arrows of the American Indians—these were some of the methods of communication adopted by peoples of long ago. Later came the elaborate signal systems of navies and armies, faster modes of transportation, and, in the nineteenth century, the telegraph and the telephone.

[Descriptions of these last-named devices, of such tremendous importance to-day, may be found in the articles TELEGRAPH and TELEPHONE.]



Photo: U & U

CAROLINE SHOWS AN EARLY INTEREST IN RADIO



Photo U S Dept of Agriculture

ONE INSTANCE OF AID TO AGRICULTURE

A group of farmers in a back room of a country bank in Iowa receiving market reports by radio

The Scientific Basis of Radio. Though radio is based on modern physics, the force that man is utilizing to conquer space has always existed. Like a sleeping giant, it lay dormant through the ages, awaiting the magic touch of scientific progress. In wireless communication, whether it be the telegraph or the telephone, the agency of transmission is the electromagnetic wave. All of the investigations in the field of electric and magnetic phenomena, preceding radio by many centuries, were necessary for the invention of practical wireless apparatus. The detailed story of those investigations is told elsewhere in these volumes (see ELECTRICITY and topics indexed therewith), but the basic principles of electromagnetism may be repeated here: namely, that electricity in motion produces a magnetic field, and a magnetic field in motion across an electric conductor produces an electromotive force. These principles were discovered and made known in the first half of the nineteenth century, during a period that also witnessed considerable investigation of light phenomena. These studies, too, belong to the story of radio.

At the opening of the century, Thomas Young (1773-1829), an English physicist, offered convincing proof of the wave theory of light—that it travels from luminous bodies in undulations similar to water waves. It is easy to visualize the series of widening circles that move outward from the point of disturbance when a stone is thrown into a pool. Young demonstrated that light travels through space in some such manner, but, of course, by virtue of another medium than water. It is supposed that light waves are undulations of an elastic, all-pervading medium called the *ether*.

[Some scientists of to-day reject the theory of an ether, but the conception is a useful one, and the name is retained in the literature of physics as a matter of convenience]

Referring again to our analogy of a pool, we must remember that the water particles themselves do not move outward, but up and down, each set of vibrations causing the water beyond to begin to vibrate. We have simply a transverse wave movement, with a series of crests and troughs. If we think of the distance between any two sets of crests as the length of the wave, and the number of crests passing a fixed point in one second as the frequency of the wave, it will be easy to understand the meanings of *wave-length* and *frequency*, as used in the terminology of radio telegraphy and telephony.

Nineteenth-century scientists accepted the wave theory of light with practical unanimity, and a brilliant mathematician and physicist of Edinburgh, James Clerk Maxwell (1831-1879), added to this conception by showing the connection between light and electromagnetism. In the later years of his life, he proved by mathematics that light consists of transverse

undulations of the medium that causes electric and magnetic phenomena, giving us the electromagnetic theory of light. He also predicted that it would be possible to propagate effects through space, in the form of electromagnetic waves, by means of electrical discharges.

About 1888 a German scientist, Heinrich Hertz (1857-1894), actually created such waves by means of a machine called an oscillator. In this device, two metallic plates, separated by two metallic spheres, are connected with the terminals of an induction coil. A small space between the spheres provides a spark gap. At each interruption of the primary circuit of the coil, the plates are energized to a point where there is a difference in potential sufficient to break down the insulation of the gap. As the electric current surges back and forth across the gap, millions of times a second, two oscillating fields, at right angles to each other, are produced in the region about the machine; one is an electric field, the other magnetic. Two such oscillating fields generate an electromagnetic wave, and a series of waves is produced as the vibrations continue.

These waves were detected by Hertz, in his original experiments, by means of a circular loop of wire containing a small spark gap. When he placed the loop in the plane of the electromagnetic waves, small sparks appeared in the gap of the wire. Hertz also demonstrated that the waves can be reflected, refracted,



Photo: P & A

SMALLEST RADIO SET

This receiving set easily fits into the palm of the hand and weighs only a few ounces It was made in England, and excellent reception of programs was reported

transmitted through insulators, and measured as to length and frequency. He showed that they differ from light waves only in length and frequency, and he opened the way to a series of experiments that made wireless communication a reality.

We know now that the Hertzian waves, as they are called, occupy one section of a vast scale of electromagnetic radiation, of which about seventy octaves have been identified. All of these rays travel with the speed of light, about 186,300 miles, or 300,000,000 meters, per second, but they differ in wave-length and in frequency. The shortest, which have the highest frequency, are the cosmic rays discovered by Robert A. Millikan. These have their origin in mysterious events occurring in the realms of outer space. Professor Millikan believes that they are heralds of creation,



Photo U S Dept of Agriculture

A MODERN FARM BOY

He has learned enough about radio engineering to enable him to build his own radio set.

telling us of the formation of elements through the union of electrons and protons (see ELECTRICITY). Next in length are the gamma rays emitted by radium and other radioactive substances. These are messengers of disintegration, telling of the breaking up of atoms. Then come the better-known X-rays, then ultraviolet light, and then visible light. Between visible light and Hertzian waves are the infrared rays, which produce the sensation of heat. The Hertzian waves, which vary from a few feet to several miles in length, and whose vibrations usually do not exceed 30,000,000 per second, are the instruments of radio transmission. The slowest rate at which light waves are emitted is about 400,000,000,000,000 per second.

About four years after the successful Hertz experiment, described above, Sir William Crookes, in the London *Fortnightly Review*, made this interesting prediction:

> Rays of lights will not pierce through a wall, nor, as we know only too well, through a London fog. But the electrical vibrations of a yard or more in wave-length . . . will easily pierce such mediums, which to them will be transparent. Here, then, is revealed the bewildering possibility of telegraphy without wires, posts, cables, or any of our present costly

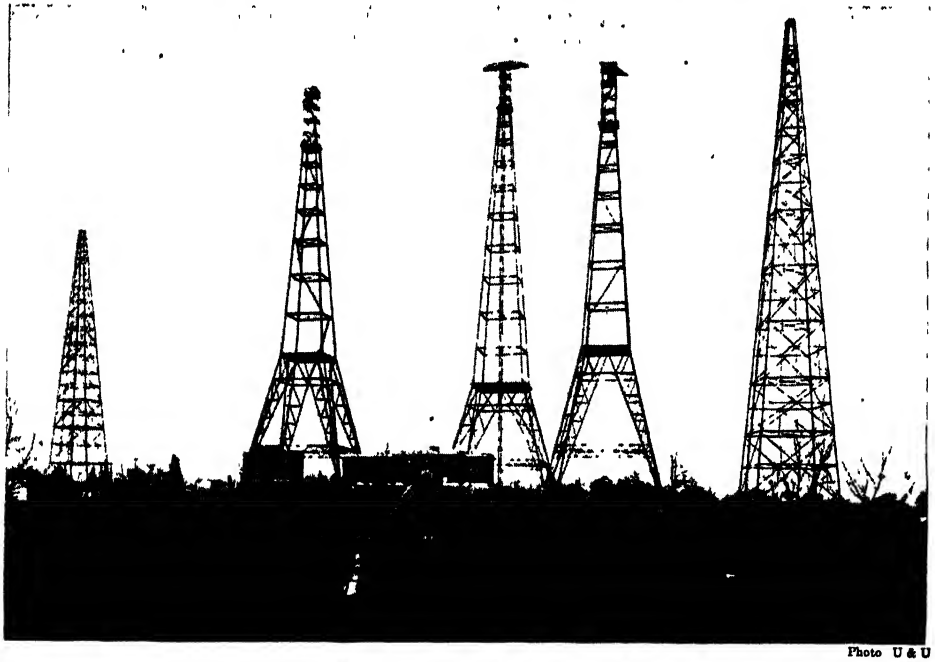


Photo U & U

NAVAL RADIO STATION AT ARLINGTON, VIRGINIA

The call letters of the station are NAA. The transmitters are operated by remote control from the building of the Navy Department in Washington, across the Potomac River from Arlington The towers are six hundred feet high.

appliances. Granted a few reasonable postulates, the whole thing comes well within the realms of possible fulfillment. At the present time, experimentalists are able to generate electrical waves of any desired wave-length from a few feet upward, and to keep up a succession of such waves radiating into space in all directions.

This is no mere dream of a visionary philosopher. All the requisites needed to bring it within the grasp of daily life are well within the possibilities of discovery, and are so reasonable and so clearly in the path of researches which are now being actively prosecuted in every capital of Europe that we may any day expect to hear that they have emerged from the realms of speculation into those of sober fact.

Many minds were at work on the problem of making the waves carriers of messages, but of special importance is the contribution of Edouard Branly, a French scientist of the Catholic University of Paris, who devised an improved apparatus for detecting Hertzian waves. In experiments begun in 1890, he demonstrated that these waves were capable of affecting metallic filings, causing them to cohere when the filings were placed in a glass tube and the tube made a part of an electric circuit. Sir Oliver Lodge carried on a valuable series of observations with the Branly coherer, or detector, in 1893-1894, and in 1895 Professor Popoff, a Russian, made use of it in apparatus for detecting electric waves at a distance. These and other investigations were all of utmost value to the young Italian scientist Marconi, who is honored as the inventor of the first practical instrument used in wireless telegraphy.

The devices used in both radio telegraphy and radio telephony are explained in detail in another section of this article, but it will be interesting at this point to know how the electromagnetic wave, which in everyday experience is an intangible, unknowable thing, can be used as the carrier of sound. In all radio communication, we must have transmitting and receiving apparatus. The transmitter, generally speaking, consists chiefly of apparatus for generating high-frequency alternating currents; and an antenna, or aerial, which, when fed by these currents, radiates electromagnetic waves into space. In the case of ordinary radio telegraphy, a key is used to stop and start the currents, resulting in the transmission of waves that reproduce the dots and dashes of the international code.

Radio telephony requires somewhat different apparatus, for the ear must perceive the modifications that correspond to spoken words, music, and other natural sounds. In brief, then, the sounds of voices or instruments at the transmitting end are caught by a microphone. This reproduces, in the form of electrical pressure, the variations of air pressure made by the sound waves. Wires carry these



Photo: U & U

The Most Northerly Radio Station in the World. It is located at 68 degrees north latitude, in the little town of Wiseman, Alaska. A lone member of the United States army, Private C. J Ulen, is in command. Ulen is the United States commissioner, postmaster, and president of the school board, and he lives in the best house in town. His portrait appears in the upper corner; his mode of transportation in winter is pictured below.

impulses to apparatus that transforms them into electromagnetic waves. The latter are radiated through the ether, as explained above, are collected by the antenna of the receiving apparatus, and are transformed back into electric impulses. A receiver or loud speaker then converts the electric signals into sounds that the ear translates as words, musical tones, etc.

In listening to the sounds from a first-class receiving set, we are amazed at the naturalness of what we hear. Indeed, we are sometimes unable to distinguish between the voices of persons in an adjoining room and voices coming to us from a loud speaker in that room. Actually, of course, we hear a translation of the



Photo U & U

RADIO PARASOLS

Japanese ladies are able to use their parasols for a double purpose. Receiving sets are built into the handles, and the ribs of the parasols serve as antennae The novelty is very popular

sounds. Another interesting point is the fact of instantaneous reception, for our electromagnetic carriers are everywhere traveling at the rate of 186,300 miles a second. While a lecturer is speaking, the persons in the hall do not actually hear his words until after they have reached the ears of radio listeners, hundreds or thousands of miles away. The sound waves travel to the audience in the hall at the rate of about 1,100 feet per second. The radio wave travels with the swiftness of light, which, as we know, is a velocity that would carry a ray completely around the globe about seven times in one second.

Radio in Modern Life. The wireless telegraph has played its part in world affairs since about 1898. In 1896 Marconi conducted a series of successful experiments with his apparatus in England, and also made his first application for a British patent. Continuing his experiments, he was able constantly to widen the distance between the transmitting and receiving stations, and in July, 1898, reports of yacht races off Ireland were transmitted to the newspapers, marking the first use of wireless for news dispatches. In December, 1901, the letter "S" was transmitted from Newfoundland and received at Poldhu, Cornwall. The following February, test-letter signals were received by a steamer at a distance of 2,099 miles from the Cornish coast, and on December 19, 1902, the Atlantic was spanned for the first time by actual radio messages.

From these beginnings, radio telegraphy has firmly established itself as the principal means of communication between ships at sea and between ships and shore, while a multitude of stations on land serve to make the world a neighborhood of communicating nations. The use of radio telegraphy has been standardized by international agreement, and since the early part of the present century, nearly all civilized governments have made the installation of wireless on passenger-carrying vessels at sea compulsory. Such a law was passed by the United States Congress in 1910. In 1911 the Radio Service Section of the Department of Commerce was organized to administer this law, which was extended to cover cargo vessels in 1912. In this year, too, a signal corresponding to the letters "SOS" was adopted by all the nations, to serve as a call for help, anywhere on the seas It is an inviolable law of the sea that any vessel receiving this signal shall render assistance as quickly as possible. Travel on water is also made safer by the use of radio fog-signal stations, now operated in connection with the life-saving service of every nation. We also have the radio compass, a device that enables a navigator to locate other vessels or to determine the position of his ship with reference to land.

Because of its reliability and reasonable cost, trans-oceanic wireless has taken over a considerable part of the business formerly done by cable, and has been instrumental in lowering the cost of sending messages by cable. The wire telegraph will always have its place on land, but for communication between widely separated points, and in regions where wire installation is impracticable, wireless is indispensable, and it has been of incalculable value to trade and commerce.

The World War brought about an intensive development of all types of radio apparatus, and wireless became the outstanding method of communication, not only in the military

field but between zones of operation and the outside world. Radio telephony shared in this development, and was especially valuable as an adjunct to the airplane service. Before the war ended, an occupant of a plane was able to send spoken messages to an operator on the ground, from a height of two miles. Radio telephony as we know it to-day owes much to a delicate instrument invented by Lee De-Forest—the three-electrode audion. Engineers of the Bell Telephone Laboratories and of the General Electric Company, working in the one case to devise a telephone repeater, and in the other to discover improved apparatus for X-ray and power purposes, developed the audion into the high-vacuum tube of the modern radio set. In 1915 the Bell engineers demonstrated that wireless-telephone communication was practicable over distances of several thousand miles, and commercial radio telephony became a reality immediately after the World War.



Photo U & U

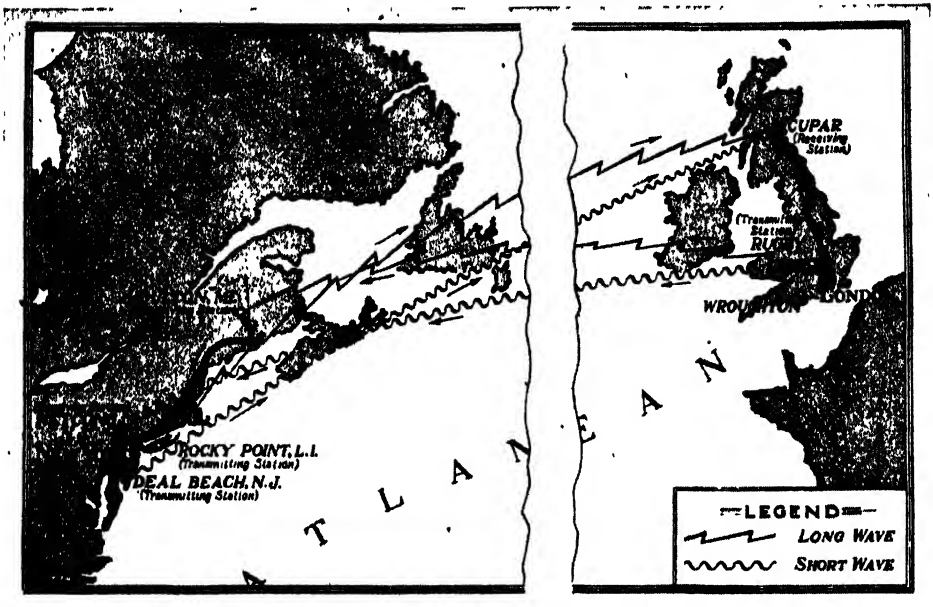
FREIGHTYARD CONTROLLED BY RADIO

Illustration shows one of the eleven centers of radio control in the vast yards of the Illinois Central Railroad near Chicago

The radio telephone did not, and probably never will, replace the ordinary telephone for personal and business communication. The limited number of air channels, the need for privacy in message-sending, and the cost of wireless-telephone apparatus, all tend to maintain the older type of telephone in its present supremacy. But just because radio telephony lacks the element of secrecy, it is an incomparable agency for broadcasting. All over the world to-day, but especially in America, listeners in their homes are hearing musical programs, church services, descriptions of sports, market reports, news of the day, weather predictions, lectures, educational talks, and so on, by virtue of radio telephony. This has become so deeply intrenched in our thought and interest that the name "radio" has come to be associated, mainly, with broadcasting and its paraphernalia.

In America to-day there are nearly seven hundred broadcasting stations, using over 600,000 watts of power. When an event of unusual importance is broadcast, as many as sixty stations may be linked together in a single hook-up. Chains of twenty to thirty stations are not uncommon. The radio-receiving equipment sold in the United States in a recent typical year had a market value of about half a billion dollars. The total number of stations in all other countries is about four hundred and fifty. In Great Britain the government has control of radio programs, but there are no restrictions on broadcasting in the United States, nor are owners of radio sets required to pay license fees, as in Great Britain and nearly all other countries. These fees vary from $3 to $20 a year. Originally, the American broadcasting stations considered that they received an adequate return through the publicity and good will accruing from their activities, but it is customary now to "sell time" to manufacturers and others desiring to take advantage of the superb advertising facilities of radio.

The rapid development of broadcasting led to such chaotic conditions in the channels of the air that Congress took action, in 1927, by enacting a law providing for the creation of a Federal Radio Commission of five members. The Commission was vested with authority to grant licenses, and to fix wave-lengths and hours of operation. For the purpose of allocation, the country was divided into five zones, based on population. In 1928 the act was amended, in order to permit the Commission to carry out a needed revision of the allocation of wave-lengths. The number of air channels is divided equally among the five zones, and these channels are classified for rural, regional, and local service. Stations in the latter class are limited to 100 watts; those in the regional to 1,000 watts. Some of the difficulty of overcrowding was overcome by the dividing of time between stations, but stations must not depart from assigned frequencies, under penalty of having their licenses revoked. In February,



RADIO ACROSS THE ATLANTIC OCEAN

As this map shows, two-way conversation across the Atlantic goes by widely different routes Eastbound the voice travels from Rocky Point, Long Island, to Cupar, in the north of Scotland, thence by wire lines to London and to the Continent The east-to-west voice goes from London to Rugby, England, by wire, thence by radio to Houlton, Me., where again the voice currents are placed upon wires and carried to New York A particular type of antenna, called a "wave" antenna, is used to pick up the waves after their long journey across the North Atlantic This antenna is about four miles long and, to the layman, appears to be an ordinary telephone line However, it functions in a very particular way as regards the radio signals which it receives.

1929, the Commission became a quasi-judicial body functioning as an appeal board for the Department of Commerce, which took over all of its administrative functions.

Other Developments. In 1927 trans-Atlantic radio telephony was established on a commercial basis, between New York and London, and the system has since been extended to include other large centers in Great Britain and on the Continent, besides Ceuta, in Morocco. There are three complete channels for trans-Atlantic telephony. The next development will be a telephone cable between America and England. In 1928 the Radiomarine Corporation of America was organized as a subsidiary of the Radio Corporation of America, for the purpose of transmitting telegraph messages to and from persons on board ship. The service is furnished by seven transmitting stations along the Atlantic and Gulf coasts, two on the Pacific coast, and four on the Great Lakes. The station at Chatham, Mass., is the most powerful marine station in the world. It is able to keep in touch with ships all the way across the Atlantic.

Special weather service by radio for aviators was initiated in 1928 by the United States Weather Bureau. The service begins at 8:15 A.M., one-half hour after the weather stations file their observations, and reports are mapped by aerologists at aviation fields by 9:30 A.M., one hour in advance of the regular weather-report releases. Aviators are thus able to start their flights with complete weather information early in the day, and are able to select routes that avoid adverse weather conditions. Previous to the establishment of a special meteorological service by radio, officials in charge of government aviation units complained that weather reports broadcast at 10:30 A.M. did not contain sufficient information for the planning of flights, and were received so late in the day that aviators were already on their journeys. As they departed without adequate data on atmospheric conditions, forced landings were frequent, and courses of flight often had to be changed. The reports are sent out from Washington, D. C., and from a branch office in San Francisco, Calif.

Radio telephoning to and from aircraft is being adopted as rapidly as possible by commercial air-transport companies. Because the spoken word gives a message so much more quickly than the code signal, it is realized that air travel can be made much safer by use of



Photo: U & U

THE FIRST MESSAGE OVER THE TRANS-ATLANTIC RADIO TELEPHONE

The date was January 7, 1927. The scene was photographed in the office of the American Telegraph and Telephone Company, that a permanent record might be preserved of the epochal event The president of the company is seated in the center, and on either side are other telephone officials

radio-telephone apparatus. Radio telephony is also being used for communication between moving trains and ships A novel and effective method of fighting forest fires has been developed, which makes use of radiophones. An observer flies above the forest in an airplane and directs the fighters in the woods below by radio. Each group of fighters carries a portable receiving set. Television, and the application of radio principles to talking moving pictures and to the transmission of news, photographs, documents, signatures, etc., are other interesting developments of this great discovery of our modern age (see *Related Topics*, at the end of this article; and the sections following, describing radio apparatus). B.M.W.

The Apparatus for Radio Telegraphy

Dampt-Wave Transmitting Apparatus. Radio transmitters are divided into two classes, according to the form of wave which they emit. The first type is called a dampt-wave or spark transmitter, and the second an un-

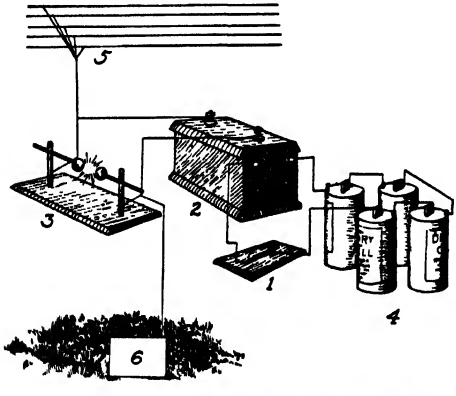


FIG 1. SIMPLEST PRACTICAL TRANSMITTER

1, key, 2, induction coil, 3, spark gap, 4, battery; 5, aerial; 6, copper plate in ground

dampt- or continuous-wave transmitter. The two types of waves are distinguished simply by the fact that, in a series of dampt waves, each successive one is weaker or of less amplitude than the preceding (see Fig. 5, A), while in a series of undampt vibrations, all are of exactly the same amplitude (see Fig. 12, A).

Dampt waves are conveniently produced by an electric spark. An apparatus for this purpose may consist of an induction coil, battery, key, and spark gap. When the key is pressed, electric current from the secondary winding of the induction coil jumps across the gap, and the sudden starting and stopping of this current shocks the ether into vibration. The vibrations are very feeble, however, unless additional apparatus is used. Much stronger impulses are set up if one side of the gap is connected to an elevated wire, and the other to the ground (Fig. 1). If a condenser and a few turns of heavy wire are added, as shown in Fig. 3, powerful waves can be obtained which may be detected at a considerable distance. An efficient spark transmitter (see Fig. 3) usually has a transformer in place of the induction coil. This permits the use of greater power, since alternating current from a power generator can be utilized. The simple spark gap is often replaced by a motor-driven wheel called a rotary gap, or by a quenched gap, which consists of several metal discs mounted parallel

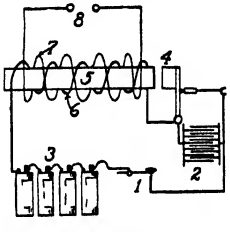


FIG 2 INDUCTION COIL

1, key; 2, condenser; 3, battery; 4, interrupter; 5, core, 6, primary, 7, secondary; 8, spark gap.

and very close together, separated by insulating washers.

The production of dampt waves by the apparatus shown in Fig. 3 may be explained as follows: Electric current from the induction coil

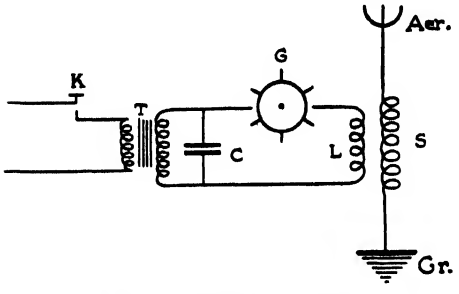


FIG. 3. SPARK TRANSMITTER

K, key; T, transformer; C, condenser, G, rotary spark gap; LS, oscillation transformer, Aer, aerial, Gr, ground.

or transformer charges the condenser (C), which immediately discharges across the gap (G) in the form of a spark. The passage of this current ionizes (see ION) the air in the space between the metal parts of the gap, and very greatly lowers its resistance. The current continues to rush across until the condenser is fully charged oppositely, that is, the part which was positive has become negative. A discharge now occurs backward through the gap, and the condenser becomes charged, as at the start.

This action is analogous to that of a pendulum which swings past its lowest position, rises to a height nearly as great as that from which it started, and then reverses its motion. The charging and discharging of the condenser continues for a brief time, but each successive rush of current is weaker, because of the loss of energy in the form of heat. As a result, the charge soon becomes too feeble to jump the

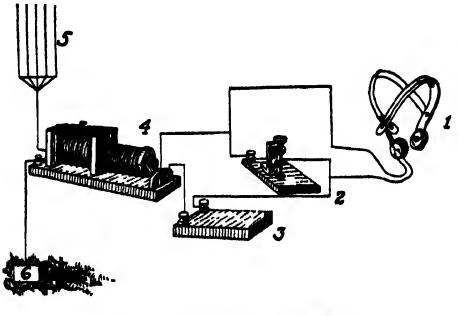


FIG 4. RECEIVING APPARATUS

1, receivers for ears, 2, detector, 3, fixed condenser; 4, loose coupler; 5, aerial, 6, copper plate in ground.

gap, and the wave-train comes to an end. There is then an interval of time when no waves are sent out. When the condenser gets a fresh charge from the transformer, the whole cycle is repeated. There will be one wave-train or group for each reversal of the current in the transformer. In case an induction coil is used, there will be one group of waves for each break of the circuit by the interrupter, but if a rotary gap is used, the number of sparks, and consequently the number of wave-trains, may be increased to several hundred per second. The time during which the current oscillates across the gap is very small compared to the intervals between wave-trains. For example, if a transmitter sends out 500 groups per second and the length of each wave is 600 meters, the interval between successive groups of waves is $\frac{1}{500}$ second, while the time each group persists is only $\frac{1}{25000}$ second.

The frequency (N) of the electric oscillations in the circuit, which consists of the condenser (C), gap (G), and inductance coil (L) (Fig. 3), depends upon the capacity of the condenser and the inductance of the coil. The relation between them is given by the equation $N = \frac{1}{2\pi\sqrt{LC}}$. If either the capacity or inductance is increased, the frequency becomes less, and if either is decreased, it becomes larger. However, both capacity and inductance may be changed without changing the frequency, provided their product remains constant

The oscillations of current in the primary or closed circuit induce similar oscillations in the aerial circuit, which consists of the coil (S), the aerial wires, and the ground. If the transmitter is properly adjusted, the induced currents will have the same frequency as those in the primary circuit.

The wave-length of any vibration can be found by dividing its speed by the number per second. In case of electromagnetic waves, the speed is 186,300 miles, or 300,000,000 meters, per second. If a transmitter is adjusted so that the oscillations of current take place at the rate of 1,000,000 per second, then the wave-length of the radiated waves would be 300,000,000 divided by 1,000,000, or 300, number of meters. The frequencies most commonly used in radio communication range from 15,000 to 30,000,000, and the corresponding wave-lengths vary from 20,000 meters to 10 meters.

Dampt-Wave Receiving Apparatus. A simple outfit for receiving signals from a spark transmitter consists of an aerial, tuning coil, detector, and telephone receiver. The action is as follows: Electromagnetic vibrations which are sent out from a transmitting station cause very rapid electric impulses to flow back and forth between the aerial wires and the ground through the tuning coil These currents alternate so rapidly that a telephone cannot respond to them. However, if a detector is placed in the circuit, as shown in Fig. 4, No. 2, current can flow only in one direction. The action of the detector is illustrated in Fig. 5.

The currents in the tuning coil occur in groups, just as do the ether waves which cause them. The detector allows half of each alternating pulse to go through it, so that several current pulses flow in one direction through the telephone receiver, each time a wave-train arrives. The series of direct-current pulses resulting from each wave-train combine to produce a single pull upon the metal diaphragm of the telephone. During the interval before the next group of waves arrives, the diaphragm springs out to its normal position, so the sound produced in the telephone is a musical note which has one vibration for each wave-train in the transmitted message.

Tuning the Receiver. To tune the receiving set to the wave-length used by some particular transmitter, the inductance of the tuning coil is changed, usually by varying the number of turns of wire upon it, or the capacity of one or more condensers may be varied (see Figs

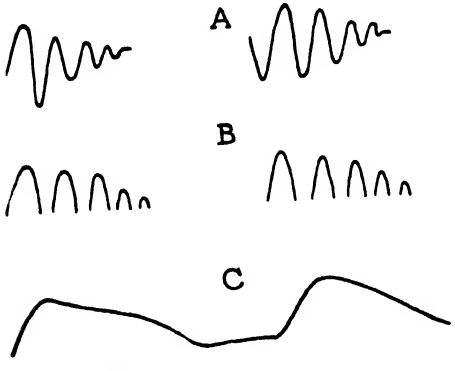


FIG. 5 DAMPT WAVES

A, diagrams of two wave trains; B, wave trains modified by the detector, C, curve showing rise and fall of current in the telephone receiver

8, 11). These adjustments are so made that the signals reach their maximum strength. The tuning is said to be *sharp* when the adjustments mentioned have to be carefully made in order to receive a given signal. The tuning is *broad* if the inductance and capacity may have a wide range of values and yet allow the signal to be heard.

The sharpness of the tuning depends largely upon the degree of damping; that is, the rapidity with which the oscillations in a wave-train die away, or, in other words, upon the number of individual waves in each group. If the damping is large, which means that the number oscillations per wave-train is small, the toke) will be broad. On the other hand, if the ing is small, the tuning will be sharp receiver. The degree of damping, and quently the sharpness of tuning, is de by the type and adjustment of the tr The advantage of sharp tuning is th

ence, or mixing up of signals from different stations, can be largely avoided.

Detectors. Several types of detectors have been used in receiving wireless messages. The earliest type used, called a *coherer* (Fig. 6),

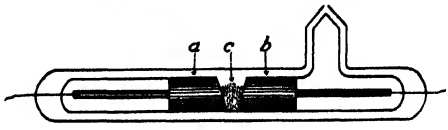
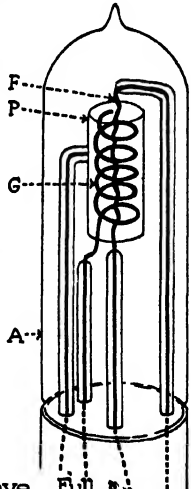


FIG. 6. COHERER

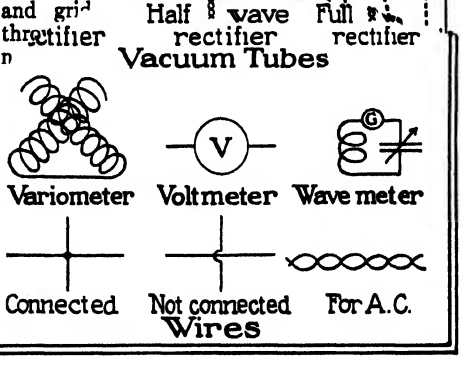
A, electrode; B, electrode, C, filings.

consists of a hollow glass tube containing metal filings loosely held between solid-metal rods, which are slipped into the glass tube. Electromagnetic waves cause the filings to cohere, or stick together, and the resistance is lowered. A battery then causes current to flow through the coherer and operate an electric bell. A tapper is provided which shakes the tube and loosens the filings during the intervals between groups of waves. This detector is not very sensitive, and is seldom used.

The simplest detector now in common use consists of a crystal of some mineral such as carborundum, silicon, or galena, and a pointed metal rod or wire which touches the surface of the crystal (see Fig. 4, No. 2). The crystal permits electric current to flow through it in one direction, but not in the reverse direction. The result is that the rapidly alternating currents in the receiving apparatus are detected or rectified, as previously explained.



The Audion, or Triode. The most sensitive and widely used detector is the *triode* (see Fig. 7). This is a glass tube in which are mounted three metal parts—the filament plate and grid



Thomas A. Edison. He found that a metal plate inserted into an electric-light bulb became negatively charged when the filament was lighted. J. A. Fleming of England was the first to make use of a vacuum tube, constructed in this manner, as a radio detector. Dr. Lee De Forest in 1906 vastly improved the sensitiveness of the vacuum tube as a detector of electromagnetic waves by making use of a third element, known as a grid. This is usually a spiral of wire or a cylinder of metal perforated with holes, which surrounds the filament.

Vacuum-Tube Receiver. A receiving circuit containing a triode is shown in Fig. 8. The filament is heated by current from a battery (A), and the plate is made electrically positive by a battery (B), which is connected between it and one terminal of the filament. Under these conditions, vast numbers of tiny negative electric charges, or electrons, escape from the heated filament and fly across the vacuum

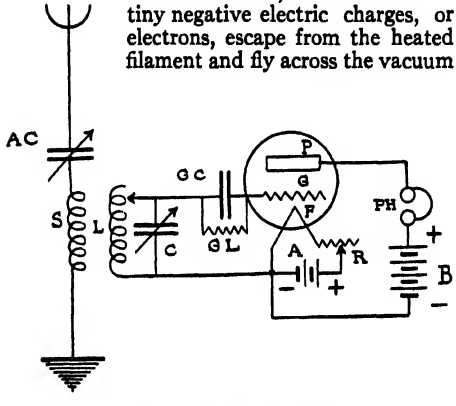


FIG. 8. TRIODE RECEIVER

AC, aerial tuning condenser, S L, loose coupler (tuning coils); C, variable condenser, GC, grid condenser, GL, grid leak; G, grid; P, plate, A, filament battery; B, plate battery; F, filament; PH, telephones.

space to the plate and flow through the battery (B) and the telephone receiver. This steady current does not affect the telephones until its rate of flow is changed by the action of the grid. This happens when high-frequency currents are set up in the circuit L C, by induction from the aer[illegible] of current [illegible]tiv[illegible] is

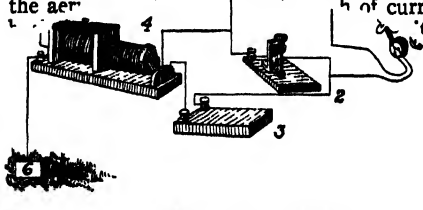


FIG. 4. RECEIVING APPARATUS

1, receivers for ears, 2, detector, 3, fixed condenser, 4, loose coupler; 5, aerial, 6, copper plate in ground.

gap, and the wave-train comes to an end. There is then an interval of time when no waves are sent out. When the condenser gets denser (G C), or through a high resistance (G L) called a grid leak, which is connected in parallel with the condenser. The electronic current from the filament to the plate immediately starts again, and is registered by a click in the telephones.

There is one click in the telephones for each wave-train in the signal, and the musical note which results will have the same number of vibrations per second as there are wave-trains in the message received. From this it is evident that each spark transmitter has its own characteristic tone. It should be clearly noted that the current which operates the telephones is furnished by the battery (B), and that the triode acts merely as a very delicate trigger, or relay, to start and stop this current.

Undampt-Wave Transmitters. Undampt ether waves may be produced by three different types of transmitting apparatus. The first is the *high-frequency generator*. This is a large machine, similar in many ways to the electric generators used in city power plants for producing low-frequency alternating current. Several of the high-powered radio stations of the world are equipped with generators of this kind.

The Arc. The second type is the Poulsen arc transmitter (see Fig. 9). In its simplest form, it consists of a carbon and a copper rod between which direct current from a generator passes in the form of an arc. The arc terminals are shunted by a circuit consisting of a condenser and an inductance coil. The aerial and ground may be connected to the secondary of a loose-coupler, as shown in the figure, or con-

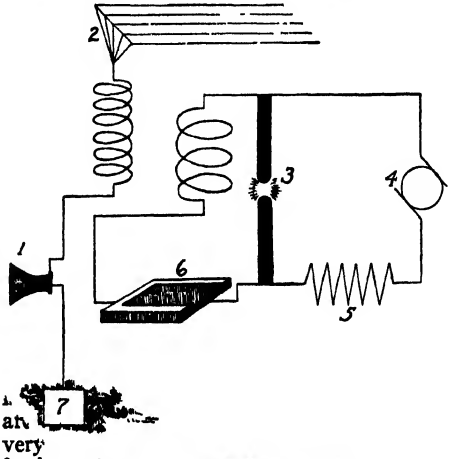
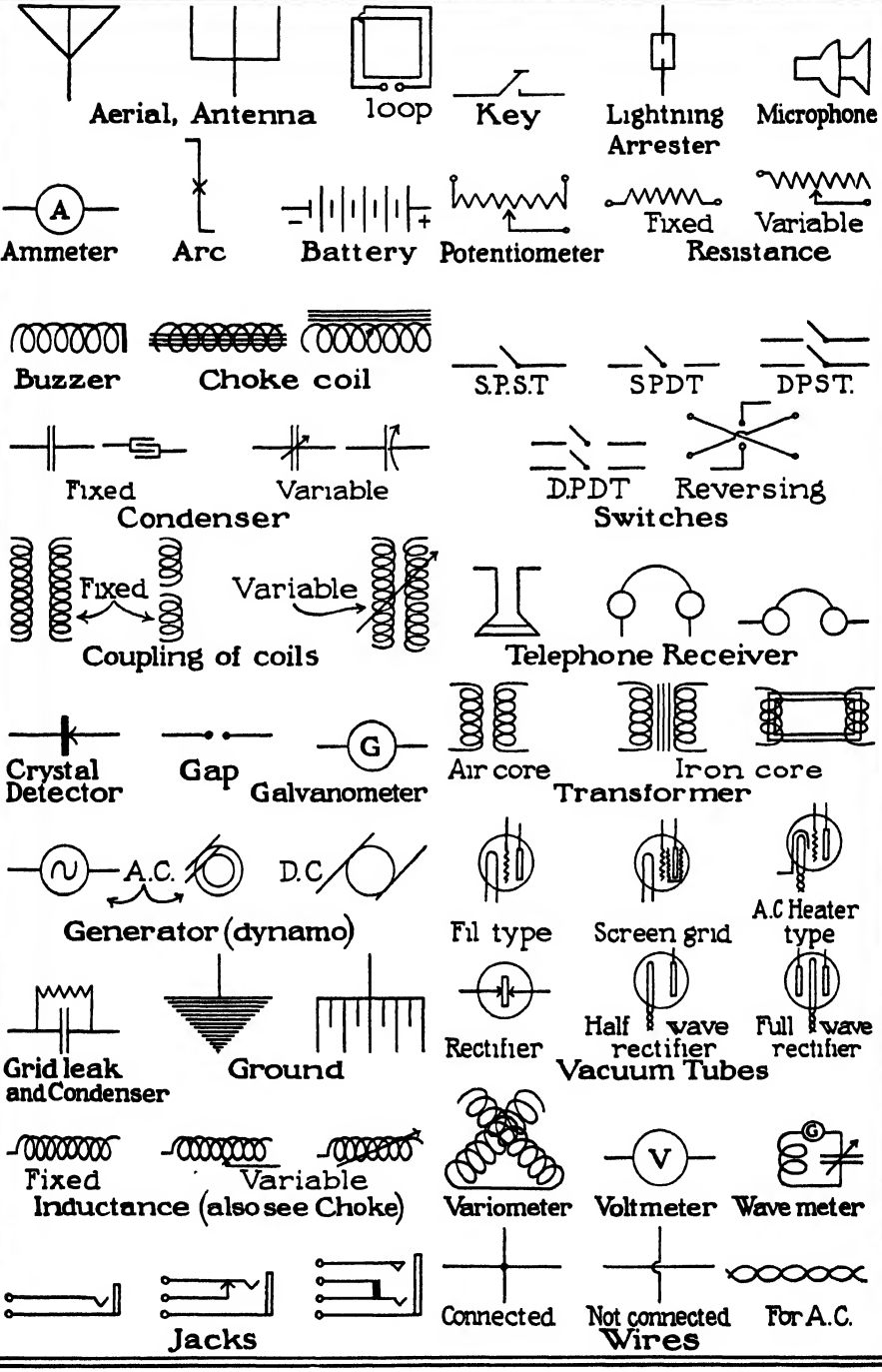


FIG. 9. TRANSMITTING SYSTEM

[illegible]one transmitter; 2, aerial; 3, arc; 4, dynamo; [illegible]ternate [illegible]nce; 6, condenser; 7, copper plate in ground.

[illegible] very [illegible] forth [illegible] through [illegible] respond [illegible]rectly to the arc. In the latter case, placed in [illegible] placed in series with the aerial, and 2, current [illegible]ty between the aerial wires and the action of t[illegible]

SYMBOLS USED *in* RADIO



ground serves as a condenser. During the operation of the arc, oscillations are set up in the condenser circuit, with a frequency which

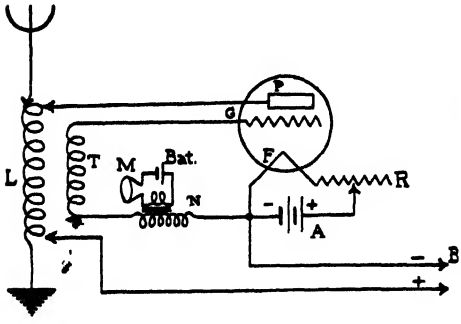


FIG. 10. VACUUM TUBE TRANSMITTER

L, tuning coil, T, tickler coil, M, microphone, N, telephone transformer, Bat, battery (Other symbols as in Fig 8)

depends upon the values of capacity and inductance used. These oscillations, which are all equal, cause undampt electromagnetic waves to be radiated from the aerial. Arc transmitters are used by many high-powered radio stations.

Vacuum-Tube Oscillator. The third type of continuous-wave transmitter is the triode, or vacuum tube. The tubes used for this purpose are usually larger and more rugged than those which are used in receiving apparatus. A simple transmitting circuit is shown in Fig. 10. Its action may be briefly stated as follows:

Electrons from the heated filament fly through the vacuum space to the plate, and flow through coil L to the battery or generator and back to the filament. The sudden starting of this current causes a reverse current to be induced in coil T, which is attached to the grid of the tube. The grid becomes negative, and by its repelling force stops the flow of electrons from the filament to the plate. This sudden stopping of the current in coil L causes a current to be induced in coil T in such a direction as to make the grid positive. The flow from filament to plate then starts again. This cycle is repeated indefinitely, and the oscillations of the current produce undampt ether waves which are sent out from the aerial.

Apparatus for Radio Telephony

The Transmitter. Any transmitter of undampt waves may be used as a radiophone transmitter, by aid of some device for modulating the waves. The type of apparatus needed for this depends upon the kind of

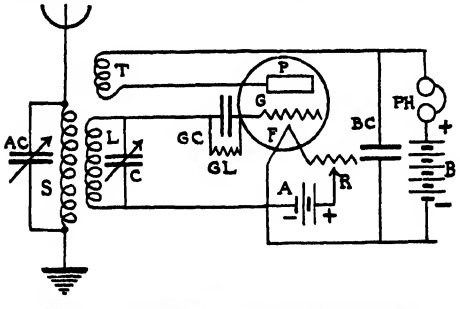


FIG. 11. REGENERATIVE TRIODE RECEIVER

BC, bridging condenser (Other symbols as in Fig. 8)

transmitter used. A crude method of modulating the current in an arc transmitter is shown in Fig. 9. A carbon microphone is inserted into the aerial-ground circuit, so that the oscillating current produced by the transmitter has to pass through it. When the diaphragm of the microphone is pushed inward by a sound vibration, the carbon granules within the microphone are packed closely together, and the resistance is lowered. When the diaphragm flies back to its normal position, the carbon granules become loose and offer a large resistance to the passage of current. Since the amount of oscillating current which can pass through the microphone is controlled by the resistance of the latter, the amplitude or strength of the transmitted waves must vary. Fig. 12 is an illustration of the manner in which the ether waves are affected by the movements of the diaphragm of the microphone. A is a diagram of a series of undampt waves; B shows the same series of waves when influenced by a telephone transmitter. The waves are no longer alike, but have widely different amplitudes. This effect is called modulation.

A much more effective device for modulating radio waves by the voice is the magnetic modulator, a simple form of which is shown in Fig. 13. Two coils of wire, A and B, are wound on a large iron frame. Coil A is connected directly to the aerial-ground circuit of an arc or generator transmitter, and coil B is connected to a battery and microphone. When the microphone is disturbed by sound waves, pulsing currents flow in coil B. This current magnetizes the iron and changes the reactance or effective resistance of coil A. When this has a high value, nearly all of the current from the transmitter flows into the aerial-ground circuit, but when the reactance is low, most of the current flows through A, and very little remains to affect the aerial. Hence the amplitude of the aerial currents, and consequently of the ether waves which are radiated, changes with every variation of the operator's voice.

Vacuum-tube transmitting sets are more widely used for telephony than any other type, because of their low cost and high efficiency. This is the type used by amateurs and broadcasting stations. Fig. 10 shows one method of modulating the continuous waves from such a transmitter. Electric currents which are varied by the microphone (M) flow in the primary winding of a small transformer (N). The secondary winding forms a part of the grid circuit of the vacuum tube. Each variation of the current in the primary causes fluctuating current to flow in the secondary of the transformer, and thus varies the charge on the grid. The grid in turn controls the current flowing in the plate circuit, which is connected to the aerial. The transmitted waves are accordingly varied in amplitude, or modulated, by the sounds which fall upon the diaphragm of the microphone.

Broadcast Transmitter. Another and more efficient method of modulating the waves from a triode oscillator is shown in Fig. 14. The microphone and transformer are connected to a modulator tube (MT), which is the same size as the oscillator (OT). The plate current of the modulator tube is controlled by the

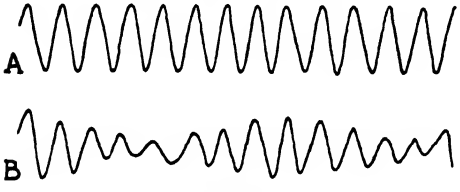


FIG 12

A, diagram of undampt waves, B, diagram of modulated waves

variations of the current through the microphone, as explained above. Both modulator and oscillator tubes are connected to the same source of direct current, and the total amount of power available remains constant. Hence, if one tube draws a large current, the other gets very little. The oscillating current in coil L is strong when the current through the modulator tube is small, and feeble when the latter is large. The waves which are caused in the ether by the oscillations in coil L must therefore vary in amplitude as these currents fluctuate. This system of modulation is widely used by broadcasting stations. If greater power is desired, several oscillator tubes and an equal number of modulator tubes may be used. It is customary to use alternating current to light the filaments of all the triodes of a transmitting set, but a battery may be used for that purpose, as shown in the diagram. The high-voltage direct current supplied to the triodes is usually furnished by a generator.

Undampt-Wave Receiver. The usual method of receiving undampt-wave signals is to use a vacuum-tube circuit which will oscillate, as described in a preceding paragraph. A common form (one of the Armstrong regenerative circuits) is shown in Fig. 11. The waves from a distant transmitting station

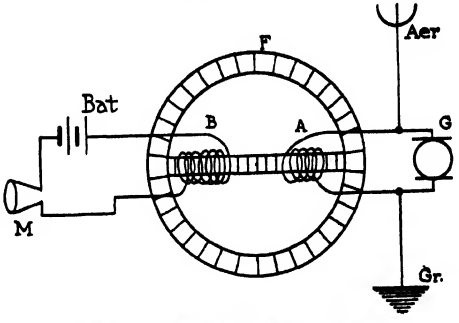


FIG. 13. MAGNETIC MODULATOR

A and B, coils, F, iron frame, M, microphone; Bat, battery; G, generator transmitter; Gr, ground; Aer, aerial.

induce electric currents in the aerial, and these in turn cause similar currents to flow in the grid circuit (LC) of the triode. Since the tube is oscillating, both the self-oscillation and that caused by the signal waves are present in the circuit at the same time. They are generally of different frequency, and combine to form electric beats by their alternate reinforcement and opposition. This is called heterodyning. It is analogous to the formation of sound beats when two musical tones of different pitch are produced at the same time.

The number of beats per second equals the difference in the two vibration rates. Thus, if a signal wave makes 100,000 vibrations, and the self-oscillation 99,000, in a second, there will be 1,000 beats per second. Since the local oscillation frequency can easily be changed by varying the capacity of the condenser or the inductance of the tuning coil, the pitch of the heterodyne note can be shifted to any desired value. The telephone receivers give a click

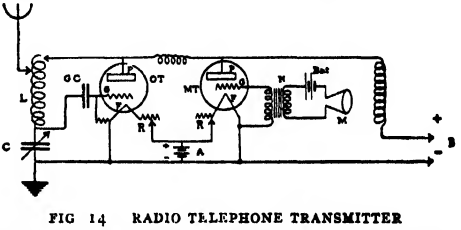


FIG 14 RADIO TELEPHONE TRANSMITTER

N, telephone transformer; Bat, battery; M, microphone, OT, oscillator tube; MT, modulator tube.

for each beat or impulse of current, and, consequently, the operator hears a musical note. If the self-oscillation is adjusted to the same rate as the signal, there will be no beats produced, and no sound will be heard.

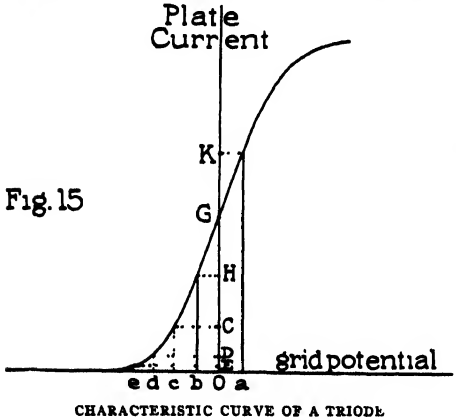
Since a crystal detector cannot oscillate, it is useless for receiving continuous waves. The vacuum-tube circuit described above can be used for spark or dampt waves by simply stopping the oscillations. This may be done by loosening the coupling; that is, separating coils L and T.

Radiophone Receivers. Any receiver which will detect radio-telegraph signals will also detect radiophone messages Since the waves from a radiophone transmitter vary in amplitude, their effect upon a detector is the same as if they were dampt. In fact, they are dampt, but not so strongly or regularly as in case of the waves from a spark transmitter.

A crystal detector works very well for telephone receiving, but its sensitiveness is not so great as that of a vacuum-tube set. When a triode receiver is used, it must not be allowed to oscillate, as the local oscillations will combine with the high-frequency carrier wave of the message and give a whistling note, and, in addition, will distort the signals until they are unintelligible.

Grid-Bias Detection. A method of detection using a grid condenser and grid leak was discussed in another paragraph (see *Vacuum-Tube Receiver*). This method is open to the objection that, if the signal is strong, serious distortion will result. In order to detect very strong impulses, the grid condenser and leak may be omitted, and the grid given a negative charge by a battery. To understand why detection occurs under these conditions, consider the curve which results when the plate current of a triode is plotted against the potential of the grid; that is, how much it is positive or negative as compared to the filament (Fig. 15).

Fig. 15



CHARACTERISTIC CURVE OF A TRIODE

If the average potential of the grid is O, the corresponding plate current has the value H (Fig. 15). If the charge on the grid alternates, as from (a) to (b), owing to an incoming signal, the plate current varies between G and K. When HG equals HK, the changes of current are symmetrical about the initial value, and there is no distortion of the impulses.

Now, suppose that the average grid potential is —Od, and oscillates between c and e. The plate current changes back and forth from E to C, but has the initial value D. The positive impulse of current DC is much larger than the negative impulse DE, so that the plate current is now predominantly positive. It is partly rectified into pulsing direct current, which will operate the telephones or loud speaker. For this reason, the process of rectifying is called "detection."

The average grid potential may be kept at any desired value, such as —Od, Fig. 15, by the use of a "C" battery of proper size (see Figs. 17 and 19). It may also be done by means of a grid-bias resistance (see G.B., Fig. 16, and R, Fig. 19). Here, advantage is taken of the potential drop across the rheostat when it is carrying current from the "A" battery. This latter method, however, is usually employed in connection with amplifier circuits, rather than with detectors (see *Use of "C" Battery in Amplifiers*, below).

Regeneration. A vacuum-tube receiver may be made more sensitive by coupling the plate and grid circuits, as explained in the discussion of vacuum-tube oscillators (see Fig. 11). Large currents are built up in the plate circuit, and if the coupling is kept loose enough, so that no oscillations are produced, louder signals are secured than would be possible without the regeneration. Such a circuit has two disadvantages. One is the distortion which may be introduced, thereby impairing the quality of the received signals. The other is the danger that it may break into oscillation. This would make the message unintelligible, and at the same time a wave may be radiated which would cause a shrill whistle or heterodyne note in other receivers in the neighborhood.

Super-Regeneration. It is possible to make some additions to an oscillating circuit so that it may oscillate at two different frequencies at the same time, one the same as that of an incoming signal wave, and another at low frequency; for example, 10,000 per second. The latter oscillation interrupts or stops the former at intervals (one twenty-thousandth of a second), and if the adjustments are correct, a very large signal current will be built up in the plate circuit, without actually breaking into high-frequency oscillation. It is really a very exaggerated case of regeneration. The low frequency is sufficiently high to cause no disturbing sound in the telephones, and thus a tube may be made to produce a very large response to the transmitted signals. Such a circuit is not very selective, and is so difficult to adjust and control that it has never become popular.

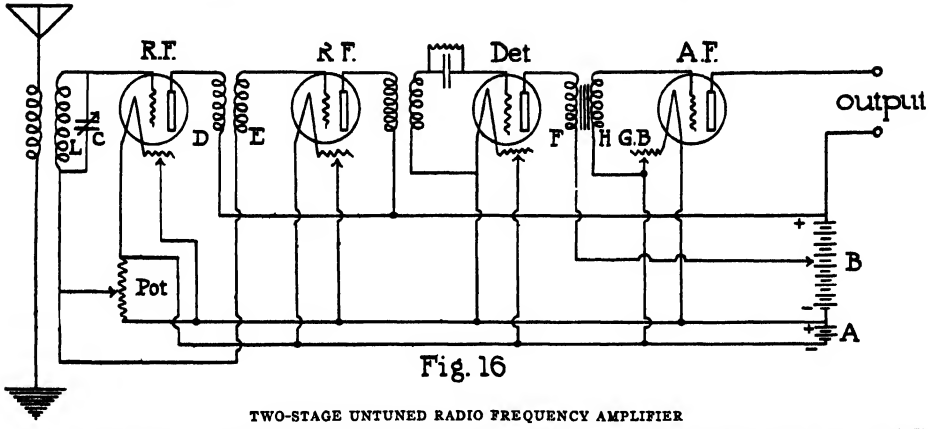


Fig. 16

TWO-STAGE UNTUNED RADIO FREQUENCY AMPLIFIER

L-C, tuned pickup circuit, D-E, untuned transformer, R-F, radio-frequency tubes, Det, detector tube, A.F., audio-frequency amplifier tube, F H, iron core transformer, Pot, potentiometer, G.B, grid-bias and rheostat.

Amplifiers

For long-range receiving, an amplifier is commonly used, in addition to a triode detector. Amplifiers which employ vacuum tubes may be divided into two classes: radio-frequency amplifiers, which magnify the high-frequency impulses before they reach the detector; and audio-frequency amplifiers, which strengthen the low-frequency current which leaves the detector.

Radio-Frequency Amplifiers. These may be classified into three groups, as follows: untuned, tuned, and superheterodyne. In the untuned R.F. amplifier (Fig. 16), electrical impulses are amplified without being rectified, by a triode which acts as a sensitive relay or repeater. Rapidly oscillating currents in the tuned circuit give the grid alternately positive and negative charges. When it is positive, electrons flow from the filament to the plate; when it is negative, the flow is stopped. The result is that strong currents rise and fall in coil D (Fig. 16), in perfect unison with the weak currents in the grid circuit LC. The flow in D induces voltage in coil E, which may be applied to a detector or again boosted by another stage of radio-frequency amplification, as indicated in Fig. 16.

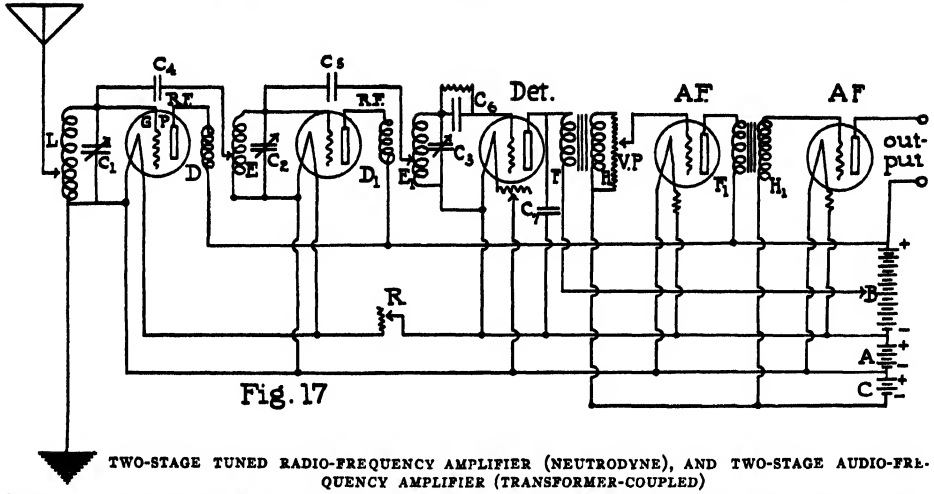
The apparatus just described is very inefficient, because only a small portion of the energy in coil D is handed on the next stage. If the coupling between D and E is made tighter, in order to secure higher efficiency, the circuits of the R.F. amplifier are very apt to oscillate, thus destroying the quality of the signals. A potentiometer may be used to prevent this (Pot. Fig. 16). It is connected across the "A" battery, so that one end is positive and the other negative. By moving the slider, which is connected also to the grid, the latter may be made positive or negative. If the grid is made positive, the circuit will not be able to oscillate, but the more positive it becomes, the weaker the signals. For this reason, the slider is kept as near the negative end as possible without causing oscillations. The use of a potentiometer results in larger direct current in the plate circuit, causes losses of energy in the grid circuit, and lowers the selectivity of the receiver.

Another method of preventing oscillations is the use of a large variable resistance in the plate circuit. This lowers the voltage in the tube, and also lowers the efficiency.

Tuned R.F. Amplifiers. A large gain may be secured by placing a variable condenser across the secondary of the R.F. transformer (E, Fig. 17). This makes it possible to tune the circuit EC to the frequency of the impulses in coil D, and much higher voltages are induced. Since a triode detector gives a response proportional to the square of the voltage applied to its grid, a twofold gain in voltage across coil E by tuning it will result in a fourfold increase in signal.

A tuned R.F. amplifier has two disadvantages: one is the presence of an extra tuning control for each stage, so that in a two-stage amplifier three controls are needed ($C_1C_2C_3$, Fig. 17). Some manufacturers have solved this problem by an ingenious mechanical arrangement which enables the operator to tune two or more circuits simultaneously with one dial. This scheme is effective provided all of the circuits have exactly the same electrical characteristics. A second disadvantage is the tendency to oscillate when tuned. In a preceding paragraph (see *Radio-Frequency Amplifier*), two methods were discussed which prevent this, by wasting some of the energy.

A very effective scheme for stabilizing the circuits and at the same time utilizing all of the available energy is the neutrodyne (Fig. 17),



TWO-STAGE TUNED RADIO-FREQUENCY AMPLIFIER (NEUTRODYNE), AND TWO-STAGE AUDIO-FREQUENCY AMPLIFIER (TRANSFORMER-COUPLED)

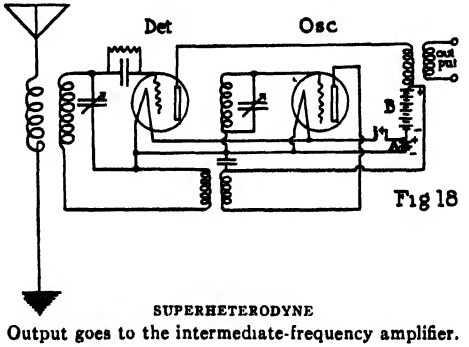
C_1 C_2, C_3, tuning condensers; C_4, C_5, neutralizing condensers, C_6, grid condenser and grid leak; R F., radio-frequency tubes, Det., detector, A F, audio-frequency tubes; D-E, D_1-E_1, tuned transformers, F-H, F_1-H_1, audio transformers, R, rheostat; C_7, by-pass condenser; V P, volume-control potentiometer.

which employs small neutralizing condensers between the grids of the R.F. stages (C_4C_5, Fig. 17). The function of these condensers will be better understood if it is remembered that a vacuum-tube circuit oscillates because electrical impulses are exchanged or thrown back and forth between the grid and plate circuits. This requires some sort of coupling, which may be magnetic, as between coils L and T in Fig. 11, or electrostatic, as in a condenser. It happens that the grid and plate of a triode form a tiny condenser, which acts as a coupler between the two parts of the system. This coupling is so small that it is not effective until the parts are in resonance (tuned), when very little coupling is needed to cause oscillations. Note that in Fig. 17 the plate coil D is not tuned directly, but the magnetic reaction of current in E upon D gives the same effect as though the variable condenser were placed across D.

By connecting a small condenser of proper capacity between E and G, an electrical impulse is impressed upon the grid (G), equal in amount and opposite in sign to the impulse given to it by the condenser G-P. This destroys the coupling, and makes the circuit very stable. Shielding of various parts of the receiver by enclosing them in metal boxes helps to prevent magnetic and electrostatic coupling between them, and aids the neutralizing condensers in making oscillation impossible. Because of its great stability and high efficiency, the neutrodyne circuit is widely used in broadcast receivers.

Screen Grid Tubes. A four-electrode vacuum tube has been devised which may be used in radio-frequency amplifiers without the need of neutralizing condensers. The plate is surrounded by a metal screen which is insulated from the other elements of the tube, and connected to the positive terminal of a battery of lower potential than that which furnishes the plate current. This positively charged screen or shield between the plate and grid has the effect of destroying the capacity coupling, so that the circuit is not likely to oscillate. In addition to this valuable characteristic, the screen-grid tubes produce remarkably high amplification, and these features together account for their wide use in R.F. amplifiers.

Superheterodyne. This is in one sense a broadly tuned radio-frequency amplifier, but differs so radically from the types already discussed as to require separate treatment. The essential features of a superheterodyne



SUPERHETERODYNE

Output goes to the intermediate-frequency amplifier.

are: first, the production of a beat note by heterodyning the incoming waves by means of a separate oscillating circuit (see *Undamped-Wave Receiver*); second, the amplification of the heterodyne note by a radio-frequency amplifier tuned permanently to one frequency.

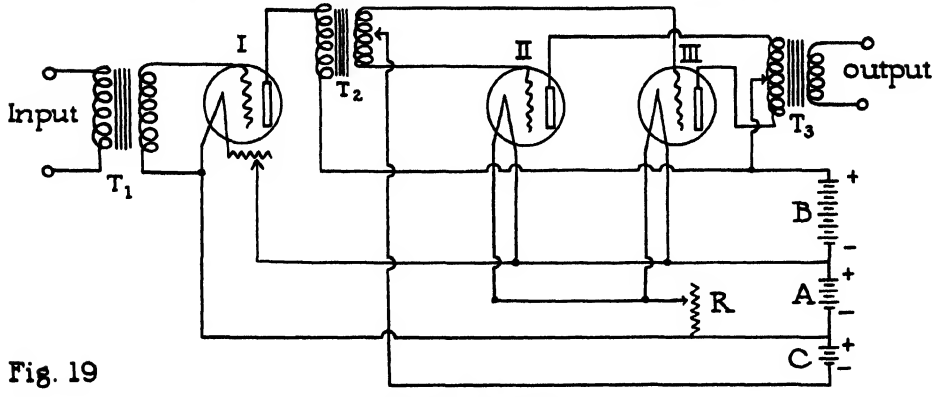


Fig. 19

PUSH-PULL AMPLIFIER

T_1, input transformer; T_2, duplex transformer, T_3, duplex output transformer, I, first audio tube, II and III, push-pull tubes, R, rheostat and grid-bias.

The heterodyning is done simply to make the second feature possible. The beat-note or intermediate frequency may be made to take any desired value by tuning the local oscillator, and is usually somewhere between 35,000 and 75,000 cycles (35 to 75 kilocycles) per second. It is easy to secure good amplification by means of transformers at such relatively low frequencies, and the transformers may be broadly tuned without the use of tuning controls, since only one frequency is used. After passing through several stages of amplification, the electrical impulses are rectified by a detector, and may be further amplified at audio frequency (see *Audio-Frequency Amplifiers*, below).

There are two distinct ways of arranging the circuits for securing the heterodyne or intermediate frequency. In the first, the impulses caused by the distant transmitter are rectified by a triode called the first detector (Det., Fig. 18), and the pulsing current is then heterodyned by an oscillating circuit (Osc., Fig. 18). The resulting beat note is fed into the amplifying system. Another arrangement combines the incoming and the locally generated oscillations directly without detecting action. In this case, the first or modulator tube serves as a radio-frequency amplifier. In both systems, the intermediate-frequency oscillation has superimposed upon it the low-frequency impulses or modulation caused by the microphone at the transmitter. When rectified by a detector, this audio-frequency current actuates the headphones or loud speaker.

Superheterodyne receivers are characterized by extreme sensitiveness, due to the large amplification; and by great selectivity, or ability to receive signals from one transmitter without interference from others working on slightly different wave-lengths. Usually, two controls are provided, one of which tunes the pick-up circuit, and the other the oscillator.

Audio-Frequency Amplifiers. These are of three types: transformer-coupled, resistance-coupled, and impedance-coupled. The first type (see F-H, Figs. 16 and 17) may be explained exactly as in case of an untuned radio-frequency amplifier, but differs in that only audio impulses from the detector are amplified. It is very popular because of the large amplification easily obtained. Its chief disadvantage is the likelihood of distortion because of unequal effect upon currents of different frequency. If the high notes of music are poorly reproduced, the result is a booming or rumbling sound, while if the low notes are weak, the sound has a shrill, "tinny" quality.

Push-Pull Amplifier. Another kind of distortion results from overloading the tubes; that is, the signal voltage applied to the grids is so large that the corresponding plate currents have unsymmetrical variations. To see why this is true, refer to a characteristic curve, Fig. 15 (see *Grid-Bias Detection*). The best operating conditions for an amplifier tube are those values of steady grid potential and plate current which give the center of the straight portion of the curve. If, however, the operating point lies in one of the bent portions of the curve (for example, d, D, Fig. 15), variations of grid potential due to incoming signals result in unsymmetrical current variations (for example, DC and DE, Fig. 15). This distortion has the same effect as if current of double frequency were also present. In the loud speaker this will cause overtones which may seriously injure the quality of speech or music. In transformer coupled amplifiers, it is usually very difficult to secure the adjustments necessary to avoid this. However, in the push-pull amplifier it is completely eliminated by using two tubes in parallel (II and III, Fig. 19) and

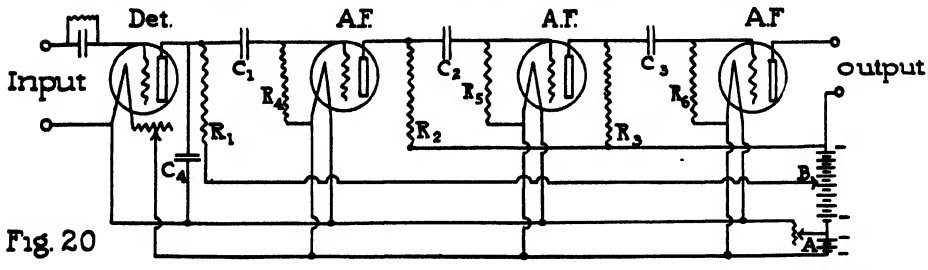


Fig. 20

THREE-STAGE RESISTANCE-COUPLED AMPLIFIER

R_1, R_2, R_3, high resistances; R_4, R_5, R_6, grid leaks; C_1, C_2, C_3, blocking and coupling condensers; C_4, by-pass condenser.

two special duplex transformers (T_1 and T_2, Fig. 19). The transformer windings are so connected that the double frequency e.m.f. (electromotive force, or voltage) induced in the secondary of the output transformer (T_2, Fig. 19), by current from one tube, is in opposite phase to that caused by the other tube, so that both e.m.f.'s are canceled. On the other hand, the e.m.f.'s of fundamental frequency from both tubes are added, and constitute an undistorted, amplified reproduction of the input e.m.f.

In addition to the advantages of large power and freedom from second-harmonic distortion, a push-pull amplifier may have the filaments heated by alternating current, since any hum produced by one tube cancels that due to the other. For these reasons, it is much used as a power amplifier in the last audio stage.

Resistance-Coupled Amplifier. In a resistance-coupled amplifier, amplification is secured by applying to the grid of a triode the potential which exists across a high resistance which is carrying current. The resistance is placed in the plate circuit ($R_1R_2R_3$, Fig. 20), and when the current varies, the potential across the resistance changes in proportion. Blocking condensers ($C_1C_2C_3$, Fig. 20) are inserted to prevent the high voltage from the "B" battery being applied directly to the grids. These condensers really pass the changes in potential on to the grid, and may be thought of as coupling the plate of one tube to the grid of the next. For this reason, this type of amplifier is sometimes called "capacity-coupled," or "resistance-capacity-coupled." Grid leaks ($R_4R_5R_6$, Fig. 20) are needed to prevent the grids from becoming permanently negative, just as in case of a detector using a grid condenser (see *Vacuum-Tube Receiver*). This amplifier does not give as great an increase in signal strength as a transformer-coupled, but has a very distinct advantage in its freedom from distortion, since all frequencies are amplified alike. It requires a much higher plate voltage for satisfactory action than does the other.

Impedance-Coupled Amplifiers. If the large resistances R R R, Fig. 20) are replaced by coils of large inductance, the circuit will amplify exactly as in the resistance-coupled This method allows the use of comparatively low plate voltage, and resembles the resistance-coupled amplifier in its freedom from distortion and in degree of amplification.

Reflex Circuits. A reflex is a scheme for making one or more tubes do double duty; that is, to amplify at both radio and audio frequencies simultaneously. Fig. 21 shows a typical reflex circuit. After being amplified

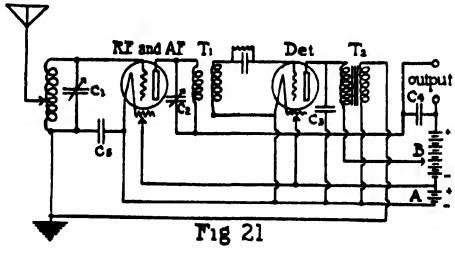


Fig 21

REFLEX

T_1, radio-frequency transformer, T_2, audio-frequency transformer, C_1, C_2, tuning condensers, C_3, C_4, by-pass condensers, C_5, blocking condensers; R F, radio-frequency tube, A.F, audio-frequency amplifier tube, Det, detector tube

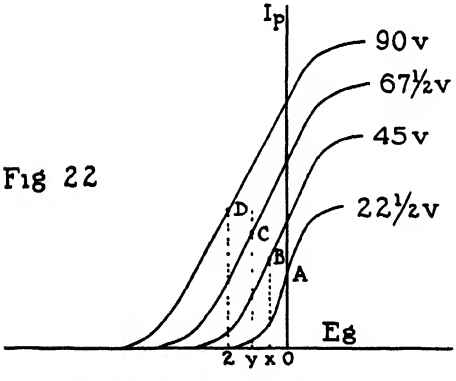
at radio frequency by the first tube and tuned transformer (R.F. Fig. 21), the electrical impulses are detected or rectified by the second tube, and then fed back to the first one through an audio transformer (A.F. Fig. 21). Thus the first triode amplifies two frequencies at once, and a louder response is secured than would be possible with the same number of tubes without the reflex feature. Some receivers employ several tubes which do double duty, so that there is a considerable saving of battery current. Some reflexes use a crystal detector on account of its noiseless and undistorted response and freedom from oscillations. Such a scheme, of course, lessens the signal strength, since a crystal is not as sensitive as a triode. Reflexes are usually difficult to stabilize, be-

cause of the strong tendency for the "double-duty" tubes to oscillate.

Another distinct advantage of a receiver equipped with a radio-frequency amplifier is the fact that it cannot radiate oscillations which would cause interference in other receiving sets. Many regenerative circuits are made to oscillate while tuning-in, and since the grid coil of the detector may be coupled directly to the aerial, the receiver acts as a small transmitter of undampt waves. These may cause a heterodyne or shrill whistling note in other receivers, and seriously interfere with reception. A stage of R.F. amplification blocks the oscillating detector away from the aerial, and greatly restricts the range of the undesirable radiations. It would be still better to adjust the detector circuit so that it could not oscillate.

Use of "C" Batteries in Amplifiers. The necessity for a negative grid-bias or negative charge on the grid may be explained by using Fig. 22. If several "characteristic curves" of plate current and grid potential are plotted, each for a different voltage of the "B" battery,

Fig 22



FAMILY OF CHARACTERISTIC CURVES FOR A TRIODE
Eg, grid potential; Ip, plate current, v, volts in plate current.

it will be found that the higher the plate voltage, the farther to the left (toward larger negative values of grid potential) the curve lies. For an amplifier, the best working point on each curve is the center of the straight portion (A, B, C, D, Fig. 22), since variations of the current about this point will be symmetrical. In order to secure this desirable condition, the potential of the grid must be given values represented by the points O, x, y, Fig. 22. Thus the higher the plate voltage, the more negative the grid should be. If this negative charge is either too high or too low, the working point will lie near a curved portion of the characteristic curve, and variations of current about this point will be unsymmetrical, resulting in distortion (see discussion of *Push-Pull Amplifiers*).

Comparison of R.F. and A.F. Amplifiers. Assuming the same step-up ratio or amplification constant for the tube and transformer in both cases, the R.F. amplifier would give a much louder signal, as the following calculations indicate. Suppose the step-up ratio is 8. Then, if a voltage of 4 microvolts (4-millionths of a volt) is applied to the grid of a radio-frequency tube, the detector would get $8\times4=32$ microvolts, and since the signal response of a detector is proportional to the square of the applied volts, the resulting output voltage would be represented by $32\times32=1{,}024$. If, however, the same input voltage (4 microvolts) is applied directly to the detector, it will give an impulse proportional to $4\times4=16$, and this amplified 8 times by an audio amplifier would give a total effect of $16\times8=128$.

In this case, the R.F. amplifier would be eight times as effective as the audio. Unfortunately, the step-up ratio is always less for radio frequency than for audio, so that there is not so great a contrast as the example indicates. However, the advantage generally remains with the R.F. amplifier, especially the tuned variety. Often such a receiver will pick up signals that would be impossible for a receiver using only audio amplification, since the voltage induced by the waves may be too small to actuate the detector, unless first amplified at radio frequency.

Volume Control. It is often desirable to adjust the volume of sound from the loud speaker, and many schemes have been devised for securing this result. One of the best ways is to use a potentiometer across the secondary winding of the first audio transformer, so that the voltage applied to the grid of the next tube may be varied (see V.P., Fig. 17). Another satisfactory plan is the use of a rheostat in the filament circuit of the radio-frequency tubes. This method should not be used in case of a detector or audio amplifier, on account of the distortion which may result.

Aerials and Antennae

The term *aerial* refers to the elevated wires, while the word *antenna* is commonly used to designate the aerial and ground regarded as a unit.

There are many types of aerial in common use; for example, the T, inverted L, cage, fan, umbrella, ground wire, and loop. The T type and the inverted L are very similar. The former has the lead-in attached at the middle, while in the latter it is attached at one end. The horizontal portion of each is usually composed of several wires arranged in a plane parallel to the earth's surface. If the horizontal wires are arranged in such fashion as to form a hollow cylinder, or similar figure, the name *cage* is applied to the aerial. The aerial fan flares out at the top like a fan, while the

umbrella type has wires radiating from a single mast, like the ribs of an umbrella.

A number of wires stretched out near the ground, but insulated from it, may be used instead of a ground connection with any of the aerials mentioned. Such an artificial ground is called a *counterpoise*. It is most often used in connection with T or inverted L aerials for the transmission of short waves. An antenna of this sort usually has a lower resistance than one which includes a ground connection.

The aerials described may be used both for transmitting and for receiving. Frequently, however, different aerials are used by a station for sending and receiving. High aerials are generally used for transmitting, because the waves sent out can be detected at greater distances. If an aerial which is high above the earth is used for receiving, the signals are louder than those picked up by a low aerial, but the high aerial has several disadvantages. The worst of these is the ease with which it is affected by stray electric disturbances in the air. Such disturbances may be caused by lightning, by the gathering of electric charges upon the wires from the air, or by electric discharges in the upper layers of the atmosphere.

All of these disturbances are sometimes called *static*, but are more properly called *atmospherics*, or *strays*. Their effect upon a receiving instrument is to give irregular grinding, clicking, or hissing noises in the telephones. Strays are most numerous and troublesome during hot, moist weather. It has been found that, when the receiving aerial is close to the ground, the atmospherics are weakened more than are the signals from a distant station. In some cases, receiving is accomplished with a ground wire instead of an elevated aerial. The wire may be laid on the surface of the ground, or buried beneath it. The best results are obtained when the ground wire is insulated from the earth. The signals are always very weak, and several stages of amplification are needed. The atmospherics are almost completely eliminated, so that receiving can be carried on even during stormy summer weather. A simple loop aerial is also quite effective in getting rid of atmospheric disturbances. A few turns of wire are fastened to a frame a few feet in diameter which can be rotated about a vertical axis. Usually, no ground is used. The loop also serves as a radio compass, for only waves which come from a direction lying in the plane of the loop will affect it. The radio-compass stations of the United States navy utilize loops for finding the direction of the transmitting stations.

Directional Aerials. A simple scheme for sending most of the energy of a transmitter in one direction is the use of a long, low, flat-topped aerial with the lead-in wire at one end. The radiations go mostly in a direction opposite to the open end of the aerial.

Beam System. It is possible to arrange the transmitting antenna in such a way that the radiated energy is sent out much like the beam from a searchlight. Behind the aerial, at a distance of one quarter wave-length of the waves, is placed a large curtain made of vertical and horizontal wires. This acts as a reflector, and the waves are concentrated within a narrow angle, usually about 30 degrees. Only short waves (under 150 meters' length) are used, and a separate antenna is required for each length of wave that is transmitted. This system is very economical, because of the low power required, and great distances are easily reached. For example, there is a two-way beam-radio service between England and Australia, with a wave-length of 25 meters.

Mechanics of the Receiving Set

A-Power Units. These devices furnish low-voltage direct current for heating the filaments of vacuum tubes. Alternating current from a house-lighting circuit is stepped down by a transformer, rectified, and filtered (see discussion of *B-Power Unit*). The rectifier is usually an electrolytic cell or a number of plates of oxide-coated metal. In some A-power units, the filter is omitted and a storage battery is charged directly by the pulsing rectified current. The battery, in turn, furnishes steady current for the tubes.

B-Power Unit, or B-Eliminator. This is a combination of vacuum-tube rectifier and filter circuit, for translating alternating current into direct current for use in place of "B" batteries (see *Vacuum-Tube Receiver*). A.C. from a power line flows through the primary of a transformer (Tr., Fig. 23), and current of proper voltage from the secondary winding is rectified by a tube.

The action of a rectifier tube may be explained as follows: Electrons emitted by the heated cathode (negative electrode) move at high speed toward the anode (positive electrode), attracted by the positive charge upon it, during one-half of the alternating-current cycle. When the current reverses at the next half cycle, the flow stops because the temperature of the plate is so low that no electrons can be emitted, even though it has a negative charge. Thus the current flows through the tube always in one direction. Usually, some residual gas is left in the tube, and many of the gas molecules are struck by the swiftly moving electrons, with the result that other electrons are knocked loose, and these add to the current flow. Some rectifier tubes are constructed with one heated element which acts as a cathode, while only two anodes or plates are used. The connections are so made that rectification occurs for both halves of the

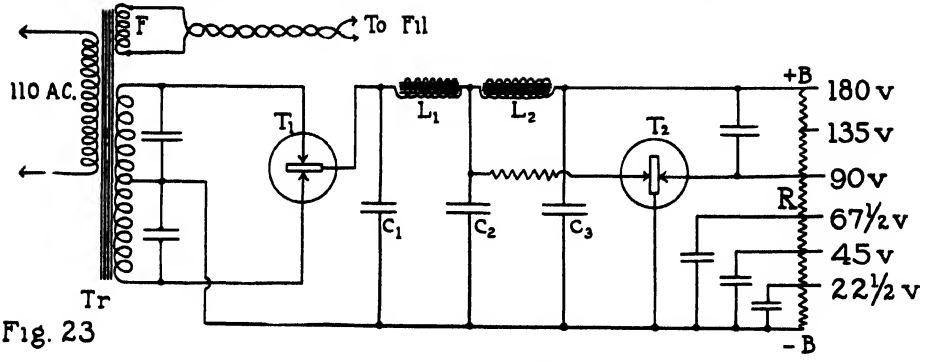


Fig. 23

B-POWER UNIT, OR B-ELIMINATOR

Tr, transformer, T_1, rectifier tube, T_2, regulator tube, L_1, L_2, choke coils, C_1, C_2, C_3, etc, condensers; R, high resistance

cycle, and such a rectifier is called a full-wave rectifier. It has double the efficiency of a half-wave rectifier, which carries no current during half of each cycle.

Filter. The pulsing current from the rectifier is passed through a complicated circuit composed of several choke coils (L_1L_2, Fig. 23) and condensers (C_1C_2 etc., Fig. 23). The action of this circuit is quite analogous to a large storage tank fed by an intermittent stream of water. A large amount of electricity is stored up in the coils and condensers, and doled out in a steady flow. The function of this part of a B-power unit would be more accurately expressed by the term "smoothing circuit" than by "filter." Actually, nothing is filtered out except variations in the rate of flow.

Various fixed voltages may be obtained by means of taps placed at suitable intervals along a high resistance (R, Fig. 23), which is connected across the output terminals of the filter.

Regulator Tube. A regulator tube is often used (Reg. T, Fig. 23) to prevent changes in the output voltage due to surges in the power line, and to remove any slight "ripples" in the current which escaped the filter. The regulator is a two-element tube, so connected in the B-power unit that current flows through it always in one direction. The applied voltage ionizes the gas in the tube, and there is a constant discharge of electricity (electrons) between the electrodes. At night, this discharge may sometimes be seen as a faint glow, and for this reason such tubes are often called "glow tubes." The amount of ionization, and consequently, the resistance of the tube, changes with the applied voltage. When the voltage rises, the resistance falls, and since the tube is connected in parallel with a portion of the output resistance, the voltage across the latter must fall proportionately. For example, if the circuit is adjusted for a steady voltage of 90, and a sudden surge arrives which would raise it to 95 if the tube were not present, the resistance of the latter falls enough so that the part of the total voltage which is across its terminals remains at 90.

A.C. Tubes used in a receiver along with a B-power unit make it possible to operate the set directly from a house-lighting power line without batteries. In this case, a separate winding of the input transformer (F, Fig. 23) furnishes current for the filaments or heaters of the tubes. These are of two types. One has the usual three elements, and differs from a D.C. tube only in slight changes in design. The filament is very thick and rugged, and uses a heavy current at low voltage. The other type has one or more heater elements which take alternating current, and supply heat to a metal cathode which is coated with some substance, such as calcium or thorium, which emits electrons freely when heated. This cathode takes the place of a filament, and the electrical action of such a tube is the same as in the kind which requires a battery. The heater is independent of the radio circuits, so that there is usually very little trouble from humming noises.

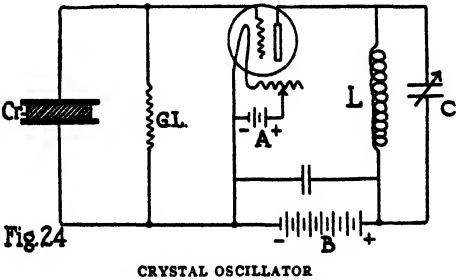


Fig. 24

CRYSTAL OSCILLATOR

Cr, crystal; G.L, grid leak.

Crystal Oscillators. Crystals of quartz have the peculiar property of vibrating at a constant frequency when alternating voltage is applied.

A thin slab with parallel sides, cut from such a crystal, and mounted between two metal plates, may replace the grid coil and condenser of a vacuum-tube circuit (see Fig. 24). When the plate circuit LC is tuned to a frequency which is anywhere near the natural frequency of vibration of the quartz slab, the tube will oscillate, and the frequency of oscillation will be determined by the crystal. This frequency depends upon the size of the quartz plate, and may be adjusted to any desired value by changing the dimensions of the piece. Because of the remarkable constancy of the oscillations, the vacuum-tube circuit containing the quartz slab may be used to control the frequency of a broadcast transmitter.

Lightning Arrester. This is simply a small gap, either in air or in a vacuum, between two metal terminals, one of which is connected to the aerial and the other to the ground. The arrester is in parallel with the primary coil of the receiver. When high electrical potentials are induced in the antenna by near-by lightning bolts, or when the aerial is directly struck, the current goes across the gap to the ground. The high voltage between aerial and ground ionizes the gas in the gap, and makes it a low-resistance path, while the inductance of the receiver coil offers a large impedance (effective resistance). Thus currents which might easily burn out the coils of the receiver are conducted to the ground and rendered harmless.

Loud Speakers. These may be classified into four groups, as follows: electromagnetic, electromechanical, electrodynamic, and electrostatic or condenser. The first group consists of loud speakers constructed on the plan of a telephone receiver, with electromagnets and steel diaphragm. Variable current from the radio set flows in the electromagnets and causes the magnetic force to become alternately strong and weak. When the magnetism is strong, the steel diaphragm is attracted, and when it is weak, the diaphragm moves away from the magnet because of its own elasticity. Vibrations are thus set up which are in synchronism (keep time) with the radio signals, and may be imparted to the air column of a conical horn.

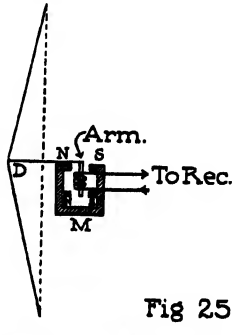


Fig 25

BALANCED ARMATURE TYPE OF LOUD SPEAKER

Arm., armature, M, magnet; D, cone; Rec., radio receiver.

Electromechanical reproducers have a fixed magnet of horseshoe shape, between whose poles is placed a delicate iron strip called the armature. This may be hinged at one end or in the middle. In the latter case, it is called a balanced armature (Arm., Fig. 25). A wrapping of fine insulated wire makes it an electromagnet which is alternately attracted and repelled by the permanent magnet, as variable current from the receiver flows through the coil. The armature is connected to a diaphragm (D, Fig. 25) by a mechanical system of levers or links, and thus passes on its motion. The diaphragm may in this type be non-magnetic, and this fact allows a wide choice in design. It may be simply a small flexible partition set into the base of a horn, or it may be a large cone of paper or other light material. In case a cone is used, it may be mounted with its edge rigidly fastened, or the edge may be free.

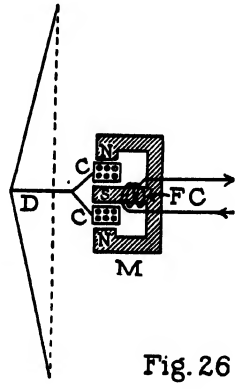


Fig. 26

ELECTRO-DYNAMIC LOUD SPEAKER

C, C, moving coil, M, magnet, F C, field coil, D, diaphragm, or cone.

The electrodynamic, or moving-coil, speaker has an E-shaped electromagnet (M, Fig. 26), and a thin, light coil acts as an armature (C-C, Fig. 26). Current from the receiver flows in the coil, which thus acquires magnetic properties, and is attracted or repelled by the field magnet, according to the direction of the current. The moving coil is attached to a diaphragm to which it imparts its vibratory motion. This type of reproducer requires a separate source of current for the winding (FC, Fig. 26) of the field magnet. A rheostat in series with the field coil gives an easy method of volume control, since a small field current gives a weak magnetic field and results in a feeble attraction for the moving coil.

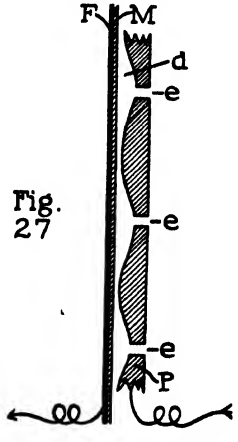


Fig. 27

SECTION OF CONDENSER LOUD SPEAKER

P, metal plate, with corrugations, M, flexible membrane, F, metallic film, e, e, e, holes.

A unique variety of electrodynamic speaker has been developed, in which the moving coil and diaphragm are one and the same. A narrow, thin strip of metal is placed between

the poles of a powerful magnet, and current from a receiver passes through the strip. The current sets up a magnetic field around the metal leaf, and the interaction of the two magnetic fields gives the strip a back-and-forth motion, in step with the current variations. This vibration is handed on to an air column in a horn.

The electrostatic, or condenser, type of loud speaker consists simply of a corrugated metal plate, covered by a thin elastic membrane, which in turn is coated with a metallic film (see Fig. 27). A high voltage is applied between the film and the plate, the two conducting surfaces serving as a condenser. When fluctuating voltage from a receiver is superimposed upon the steady voltage already present, the electrostatic attraction between the plates changes. When the two voltages add their effects, the film is strongly attracted, and the elastic membrane is drawn into the shallow depressions between the corrugations of the plate. When the signal voltage opposes the other, the attraction is weak, and the membrane moves to its initial position by elastic reaction. Thus the whole surface vibrates, and imparts its motion directly to the air. Loud speakers of this type may be built in small units which are placed side by side, and connected in parallel. In this way an entire wall may be covered, and a very large volume of sound secured.

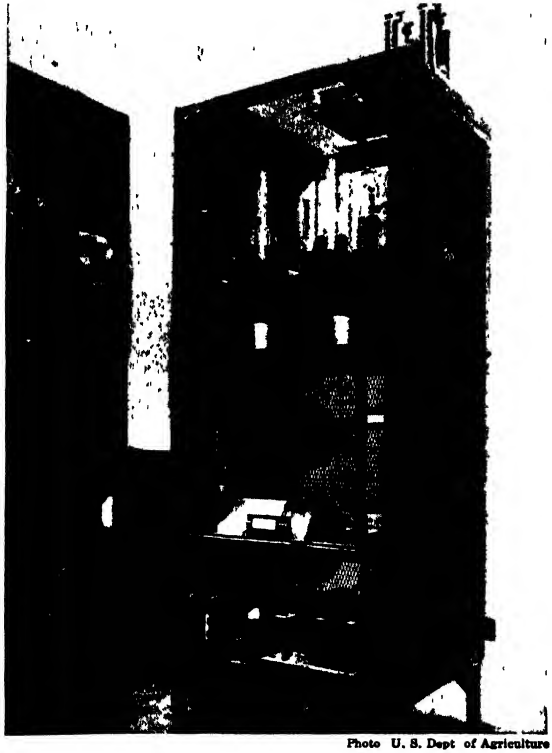


Photo U. S. Dept of Agriculture

A VITAL PART OF THE MACHINERY OF BROADCASTING

The tall glass cylinders in the top of the cabinet are the vacuum tubes, the "heart valves of the broadcasting station."

Other Devices

Microphones. Several types of microphone have been used in radio broadcasting, for translating mechanical vibrations into varying electrical currents. One is the carbon-granule microphone, in which a flexible diaphragm makes contact with a large number of carbon granules. Current from a battery is varied by the change in resistance of the carbon, which results from the varying pressure of the diaphragm in response to vibrations in the air.

Another type of microphone utilizes the principle of the condenser. A flexible diaphragm of aluminum alloy forms one plate of a condenser, and an insulated metal block forms the other plate, the two being separated by a thin air space. Vibrations of the air in front of it push the diaphragm closer to the block, and thus vary the capacity of the condenser. When connected to the grid circuit of a vacuum tube, this fluctuating capacity causes corresponding changes in the plate current, which when sufficiently amplified can be used to control the modulator of a radiophonetransmitter.

Another principle is used in the moving-coil microphone. This is very similar to the electrodynamic loud speaker, but the action is reversed. The movements of the diaphragm, which may be a very light coil or merely a thin strip of metal, back and forth in a strong magnetic field, cause fluctuating current to flow through it by induction. This current is amplified and controls the modulator of the transmitter.

A fourth type of microphone makes use of a glow discharge at high voltage across an air gap. The air is ionized, and is in a very unstable electrical condition, so that slight vibrations due to sound waves set up alternating potentials of the same frequency as the sound. The varying electrical charges on the terminals of the gap may be used to control the output current of an amplifier.

Photo-Electric Cells, or Photocells. One of the most interesting and useful of modern inventions is the photocell, or "electric eye," which translates the energy of light into electric current. A glass bulb is coated on the

inside with a thin film of potassium, sodium, or some other photo-electric material which emits electrons freely when light falls upon it. A wire which makes contact with the film is sealed into the glass, and a second wire leads to an insulated electrode. A battery has its negative terminal connected to the film and its positive end to the other electrode. When the cell is in darkness, no current flows through it, but when light shines upon the sensitive coating through a "window" or clear space in the glass, a small current flows, owing to emission of electrons from the film. This is called "photo-electricity," and the amount of current is proportional to the intensity of the light.

Photocells may be divided into two groups, according to the degree of vacuum in the bulb. A high-vacuum cell has as much of the air as possible removed. It is remarkably constant in operation, but is less sensitive than the other type, which contains much more gas. In the gas-filled cell, the electron emission from the coating is no greater than in a vacuum cell, but ionization of the gas furnishes a much larger total current for the same degree of illumination.

The qualities of light sensitiveness and proportionality of current to the intensity of light make the photocell invaluable in the process of sending pictures by wire or radio (see *Transmission of Pictures*, below). It is much used in research laboratories, and astronomers find it useful in measuring the brightness of the stars. One of the "miracles" performed by its aid is the giving of "sight" to a blind person through his ears. A photocell takes the place of an eye, and changes in illumination are indicated by sounds heard through a telephone headset.

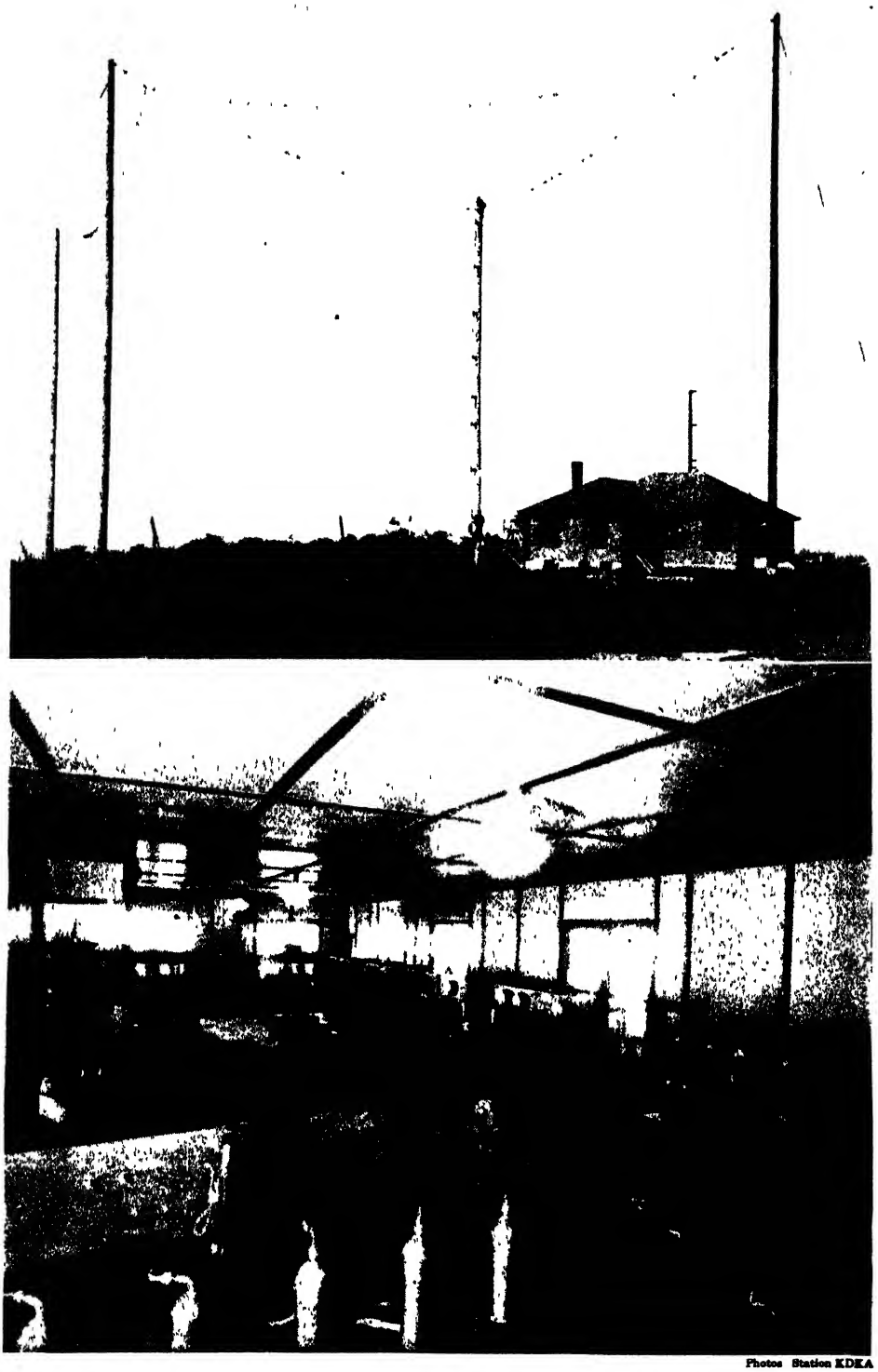
Wave Meter. This is a simple device consisting of a coil of wire with a condenser connected across its ends, and a galvanometer or other current indicator in series with the condenser. Either the inductance of the coil or the capacity of the condenser is variable, so that the circuit may be tuned. To measure a wave-length, or, more accurately, a frequency of oscillation, the wave meter is coupled to a transmitter by placing its coil near one of the coils of the transmitter. The meter is then tuned to resonance, which is indicated by maximum current in the galvanometer. If the wave meter has been previously calibrated, the wave-length and frequency are known for each setting of the tuner.

Wave Trap. This consists of a small coil of wire with a variable condenser connected across its terminals. It is placed in series with the aerial, and when tuned to any particular wave-length, it will prevent electrical impulses of that frequency from reaching the receiver. Its operation depends upon the principle that a circuit having inductance and capacity offers a very high impedance (effective resistance) to the passage through it of current which oscillates at the frequency for which it is tuned. Paradoxical as it may seem, it is true that a large current of this frequency will flow around and around within the wave trap, but will not flow in the larger circuit consisting of the aerial and ground, since it is "out of phase," or in opposition to the inducing voltages in the latter circuit. Thus an interfering wave may be suppressed, while a wave of slightly different frequency will affect the receiver.

Wired Wireless. This is a system of radio signaling in which the transmitted waves are guided to the receiving station by wires. Ordinary telephone lines, or even electric-light wires, may be used for this purpose. The sending apparatus is usually of the vacuum-tube type, and differs from the ordinary transmitter only to the extent that it has no aerial. The transmitter is coupled to the guide wire through a transformer or condenser, and oscillations are induced in the wire by the action of the transmitter. At the far end of the guide wire, the receiving set is similarly coupled to the wire, and is affected in the same way as if the waves were picked up by an aerial. This system may be used for the simultaneous transmission and reception of several messages at once, and at the same time the wire may serve for ordinary telephone communication or power transmission. When several messages are sent together, different wave frequencies are used for each. Wired wireless preserves the secrecy of messages, as the waves do not spread in all directions, but follow the wire. The power needed is very small, for the same reason.

Conditions and Varieties of Radio Telephony

Range of Transmission. This depends upon several factors: the power of the transmitter, atmospheric conditions, character of the soil, presence of forests, tall buildings, etc., as well as the sensitivity of the receiver. The range is much greater over sea than over land, probably because of the greater electrical conductivity of the water. The range over land differs widely in different directions, and there may be "dead areas" or "blind spots" where radio waves seem to be much weakened. This situation may be the result of screening by forests, high hills, or tall steel buildings. Also, the soil may be a very poor conductor in some places. Even under ideal conditions, the intensity of the waves would decrease in proportion to the distance, because the energy spreads over a larger region as it progresses.



Photos Station KDKA

A Powerful Transmitting Station. Above, exterior view of Station KDKA, showing antenna system; below, the room containing the powerful transmitting machinery.

The condition of the atmosphere has a very great effect upon the range of transmission. This seems to be due to the presence in the air of electrically charged molecules and free electrons. When the air has many ions, its electrical transparency is greatly lessened, and much energy is absorbed. The ionization is probably caused mostly by electrons emitted from the sun, and by the action of ultra-violet light. There is much evidence that the upper atmosphere is permanently ionized, and that the degree of ionization varies widely in different parts and at different times.

This region is called the Kennelly-Heaviside layer. At night it is 150 to 400 miles above the earth, while during the day it is only 50 to 100 miles up. This results in striking differences in the range of transmission of radio waves. The range at night is usually two to

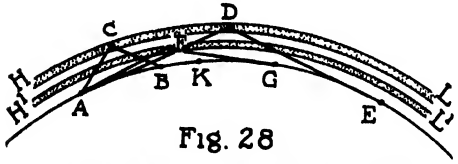


Fig. 28

VERTICAL SECTION OF EARTH'S ATMOSPHERE

H, L, Kennelly-Heaviside layer, at night; H_1, L_1, same in daytime; A, radio transmitter, B, K, G, E, receiving stations.

five times as great as during daylight. The short daytime range may be partly accounted for by the absorption of energy in ionized air near the earth, but another important factor is the reflection of waves from the Heaviside layer. This strongly ionized stratum reflects and refracts (bends) waves which reach it, so that they return to earth at great distances from the transmitter. When the Heaviside layer is high, as at night, the waves reflected from it reach the earth much farther from the transmitter than during the day, when it is low (compare paths ADE and AFG, Fig. 28).

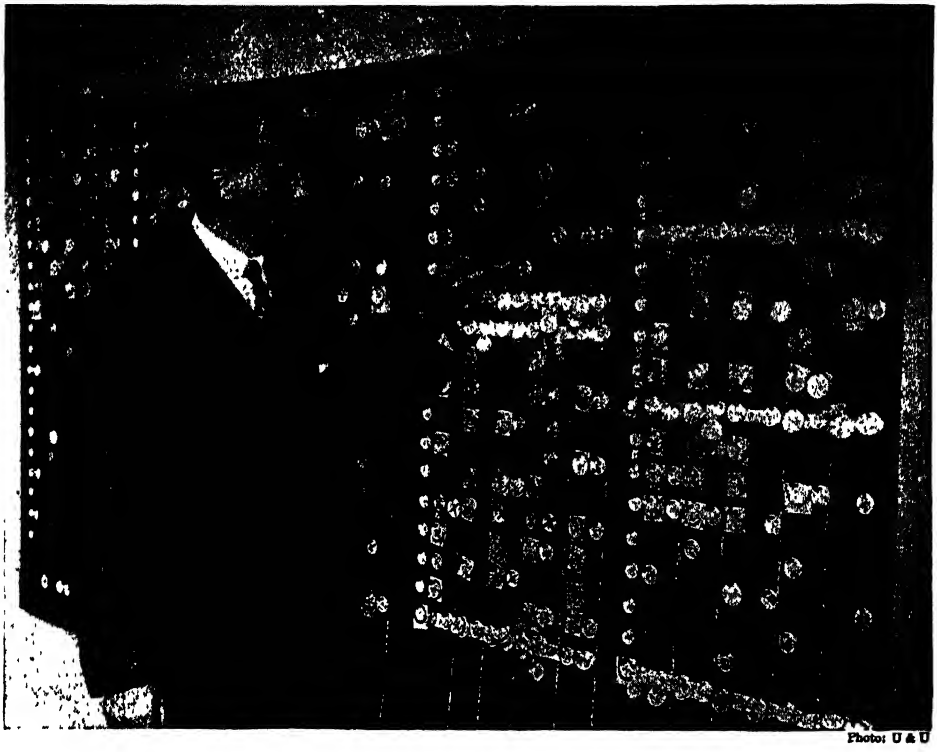
Round-the-World-Transmission. One of the curious and striking results of the presence in the atmosphere of the Heaviside layer is the possibility of sending signals entirely around the earth by several successive reflections. This effect has been noted many times, by engineers in high-powered transmitting stations. It is possible by means of automatic recording instruments to measure the time lag of the round-the-world waves, as compared with waves coming directly from a near-by transmitter. Since the time and the speed (186,300 miles per second) are known, the distance traversed can be calculated (distance equals the speed multiplied by the time).

Short-Wave Transmission. The Heaviside layer seems to be one of the chief factors in the success of all long-distance transmission, and this is especially true of short-wave work. It is now very common for radio-telegraph signals to be heard halfway around the world, even though the power used is only a few watts. (One watt equals 1/746 horse power.) While a short-wave transmitter is reaching out to a receiver several thousand miles away, it may be quite inaudible to a listener only two or three hundred miles away. The zone within which signals from a given station are not heard is too far from the transmitter to get the direct wave, and too close to intercept waves reflected from the upper air (for example, point K, Fig. 28). The width of a skip gap, or silent zone, and its distance from the transmitter, depend upon several factors, among which are the height of the Heaviside layer at that particular time, and the wave-length used. Experiments with short waves have been largely responsible for the information which has been gathered concerning the character of the ionized region of the atmosphere.

Fading. Since the degree of ionization or the effective height of the Heaviside region is constantly changing, especially at night, the waves may be reflected to a certain place at one instant, and a moment later reflected elsewhere. The effect is much like that produced by a tilting mirror, which reflects a beam of light first here and now there. The result upon a radio receiver is a series of irregular and frequent changes in the strength of the signals, which is called fading. The situation is further complicated by interference. Two portions of a wave may reach a receiver by two different paths, one along the surface of the earth (AB, Fig. 28), and the other going up to the Heaviside layer and thence back to earth (ACB, Fig. 28).

These two wave portions may be partly or wholly out of phase (the trough of one meeting the crest of the other), and destructive interference is the result. Thus the signal would be absent or very weak. The degree of interference constantly changes with the varying conditions in the Heaviside layer, and is responsible for much fading. Fading is less marked in daytime than at night, owing, perhaps, to greater stability of the ionized region. Conditions are usually worst at twilight and dawn, when the amount of ionization is rapidly changing. Fading is less troublesome during reception from a strong near-by transmitter, since in this case most of the energy reaches the receiver along the ground, without reflection from the upper atmosphere.

Broadcasting. One of the most widespread and popular uses of radio is the transmission of entertainment and instruction to all who care to listen-in. Since the introduction of broadcasting for the benefit of the public, in 1921, the interest in this form of entertainment has grown until there are hundreds of broadcast transmitters and hundreds of thousands



A "MAP" OF ALLOCATIONS OF BROADCASTING STATIONS

Markers represent all the stations in the United States So important is this device of the Federal Radio Commission that only one man is permitted to touch it, as the slightest error at any point might disarrange the entire plan for division of the broadcast bands.

of receivers in use. Many foreign countries have taken it up, and there is scarcely a point on the earth which is not within range of some transmitter.

Chain-Station Broadcasting. This has been successfully done by two different methods. One is the use of telephone lines which link all of the stations of the chain to the studio where the program is presented. The other is the use of a special radio transmitter working at a very short wave, well below the usual broadcast range. The waves are picked up by "repeater" stations, which rebroadcast, using longer waves. This system is particularly well adapted to transoceanic sending, as it enables stations in Europe and other distant regions to rebroadcast American programs, and American audiences may be entertained by speakers and musicians in foreign lands. An example of the effectiveness of such a scheme is the fact that, on many occasions, programs sent out by the Westinghouse Station KDKA have been repeated by stations in Europe, and these later heard in Eastern Asia. It is well within the possibilities of the future that by this system concerts and public functions of international interest may be heard in every part of the world.

Wave Channels. By the Federal law of 1927, the wave frequencies set aside for use by broadcasting stations extend from 550 kilocycles (550,000 cycles) to 1,500 kilocycles. The corresponding wave-lengths are 545 to 200 meters, approximately. It has been found that either of two stations whose oscillation frequencies are 10 k.c. (kilocycles) apart can be received without interference from the other. For this reason, the broadcast band of frequencies has been divided into 95 sections or channels, spaced 10 k.c. apart. Each licensed transmitter is given permission to use one of these channels, and is required to keep its transmitting frequency accurately at the center of its band. Since there are more transmitters than wave-bands, it is often necessary for several stations to use the same channel. This entails much interference, which may be minimized by widely spacing the stations, or by dividing the time of operation, in case of stations close together.

Transmission of Pictures. There are several systems of sending pictures by radio, only one



Photo: Wide World

FIRST PICTURES TRANSMITTED BY PHOTORADIOGRAM

Portraits of Calvin Coolidge, then President of the United States, and Charles Evans Hughes, Secretary of State at the time, and a reproduction of the famous *Aurora* were the first pictures ever sent by radio across the ocean They were forwarded from London to New York City on November 30, 1924, the reproductions above show one-half reduction and appear just as they were received, without retouching to remove defects

of which will be discussed, since most of the fundamental principles utilized are common to all. The transmitter has a motor-driven revolving cylinder, attached to a screw-threaded shaft, so that, as it revolves, it moves along the shaft. A photograph is wrapped around the cylinder, and light from a lamp is concentrated by a lens to a tiny spot on the picture (see Fig. 29). Since the picture is in constant motion, different parts of its surface come successively under the spot, and light reflected from it shines upon a photocell. As a result, current flows through the cell in proportion to the strength of the light, which in turn depends upon the reflecting power of the spot on the picture. A motor-driven chopper or toothed wheel interrupts the beam from the lamp, so that a series of flashes of varying intensity reach the photocell.

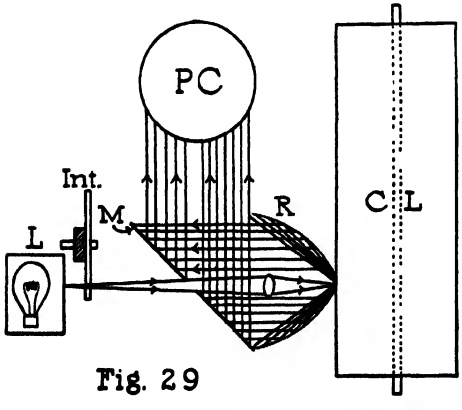


Fig. 29

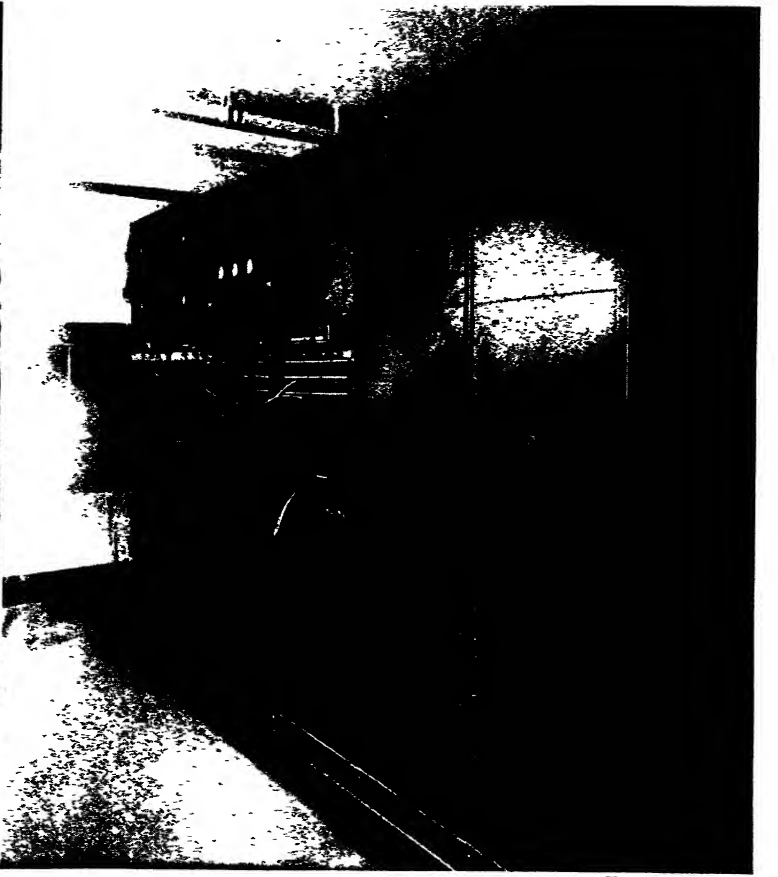
OPTICAL SYSTEM OF A PICTURE TRANSMITTER

L, lamp; Int, interrupter, or chopper; M, mirror; R, parabolic reflector, CL, cylinder on which picture is placed; PC, photo cell.

The rate of revolution of the photograph is several feet per second, and the forward motion along the shaft is about one sixty-fourth of an inch per turn, with the result that a surface of about fifty square inches is covered per minute. A picture measuring 5 x 8 inches may be transmitted in about three-fourths of a minute. The number of light flashes reflected, and consequently the number of current impulses in the photocell, is several hundred per second. This variable current is amplified, and applied as a modulation to a radio transmitter, just as the current from a microphone does in ordinary broadcasting.

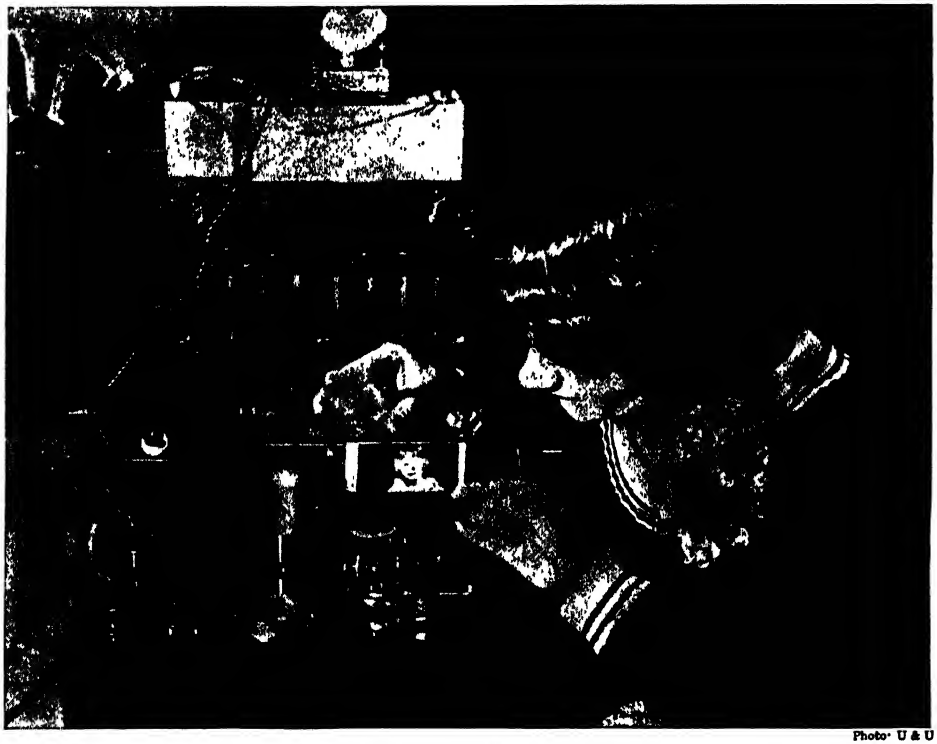


Photo: Station WLW.



Photos: Station KDKA

A Great Broadcasting Station Is Costly to Build. Above are shown parts of the equipment of Stations KDKA and WLW. At the left is a series of blowers for cooling the transformer. At the right is the main control panel containing amplifiers to strengthen the signals which go on the air.



Photo· U & U

RECEIVING PHOTOGRAPHS BY RADIO

The illustration shows one of several devices for receiving pictures broadcast by radio This machine produces the completed image within three minutes (See the article PHOTOGRAPHY)

The picture recorder is much like the transmitter. A piece of photographic print paper is wrapped around a revolving cylinder, and light from a neon glow tube is focused upon it. This lamp, which is extremely sensitive to changes of current through it, is connected to a radio receiver. The latter amplifies and rectifies the impulses induced in its aerial by the waves from a picture transmitter, so that the neon tube gives more or less light as the current from the receiver varies. The circuits are so arranged that, when a bright part of the original picture moves past the light beam, the current through the glow lamp in the receiver decreases, and the light sent to the photographic paper is feeble. On the other hand, when the original is dark, the receiver gives a strong current, and the lamp flashes brightly and prints a dark spot on the paper. Thus, point by point, the picture is received, and when the print is developed, the image appears exactly like the original. If a negative is desired, a film is used instead of print paper, and the vacuum-tube circuits are adjusted to furnish a large current to the neon tube when the original picture is bright. This gives a dark spot on the film, and makes a reversed image.

Successful photoradiograms (transmitted pictures) require exact synchronism of the moving parts at both transmitting and receiving stations, and also exact alignment of the picture and its copy, on their respective cylinders. The cylinders, which are alike in size, are driven by motors which are kept at constant speed by current from vacuum-tube circuits. These in turn are stabilized and controlled by tuning forks. Any deviation from exact motion is corrected by special radio signals which operate automatic apparatus for retarding or speeding up the motion of the recorder. Similar signals make certain that both cylinders start at the same instant. Correct framing or placement of the paper on the recorder is made possible by automatic signals which cause the glow tube to flicker if the alignment is not right, and to appear steady when the paper is correctly placed. See pages 5967, 5968. R.F.M.

Related Subjects. For supplementary information, the reader is referred in these volumes to the following articles.

Advertising	Light
Aircraft	Marconi, Guglielmo
Cosmic Rays	Millikan, Robert A.
Crookes Tubes	Moving Pictures
Electricity	Photography
Electromagnetic Theory	Radioactivity
Electromagnetism	Roentgen Rays
Ether	Television
Induction Coil	Weather Bureau

GLOSSARY OF RADIO TERMS

A Battery: Used to heat the filaments of radio tubes
Aerial: Wires used to collect energy from electromagnetic waves
Ammeter: An instrument for measuring electric current
Ampere: Unit of current
Amplification Factor: The ratio of a change in plate voltage to the change in grid potential which would produce the same variation in the plate current of a vacuum tube
Antenna: See *Aerial.*
Arc: A current discharge across a gap, conducted by highly heated and ionized vapors
Arrester: See *Lightning Arrester*
Audio Frequency: Frequencies within the range of the human ear.
B Battery: Used in the plate circuit of a vacuum tube
Beat-Note, or Beat-Frequency: The sum or difference of two tones or frequencies
B-Eliminator: See *B-Power Unit.*
Bias: See *Grid Bias*
Blocking Condenser: Used to prevent the flow of direct current
B-Power Unit: A device for converting A C to D C for use in place of a B battery
Broadcasting: Transmission of radio signals for public benefit
By-Pass Condenser: Provides a low-impedance path for high-frequency current
Capacity, or Capacitance: The ratio of electric charge to the potential
C Battery: Used to maintain a difference of potential between the grid and the filament of a vacuum tube
Carrier Wave: Refers to waves upon which a modulation is superimposed
Characteristic Curve: A graph of grid potential vs. plate current
Choke Coil: A large inductance
Condenser: A device for storing electric charge, usually metal plates separated by insulating material
Conductor: A substance which allows electric current to pass through
Continuous Waves (C.W.): Waves of constant amplitude
Coupling: Overlapping of electric or magnetic fields
Current: Flow of electricity
Cycle: A complete vibration or oscillation
Dampt, or Damped: Applied to waves whose successive amplitudes are less
Detector: A device for changing a c to d c, a rectifier
Dielectric: Insulating material
Electrode: The conductor by which current enters or leaves a tube or cell.
Electromagnetic: Applied to disturbances caused by changing magnetic and electric fields, propagated through space
Electromotive Force: That which maintains a flow of current
Electron: The smallest negative charge, a part of an atom
Fading: Changes in signal strength of distant stations
Filament: That part of a radio tube which is heated by current, for the emission of electrons.
Filter. A device for facilitating or hindering the flow of current of certain frequencies
Frequency: The number of vibrations or oscillations per second.
Generator: A machine for supplying electric current
Grid: The control electrode in a three-element tube
Grid Leak: A high resistance used to prevent the grid from becoming too highly charged
Harmonics: Frequencies which are integral multiples of the fundamental
Heaviside Layer: The ionized region of the upper atmosphere
Henry: A unit of inductance
Heterodyne: The beat-frequency formed by the combination of two frequencies
Impedance: Opposition to flow of A C, due to resistance, inductance, and capacitance
Inductance: Electrical inertia, product of the number of terms and the lines of force through a coil when unit current flows
Induction: The interaction of two magnetic or two electrostatic fields
Insulator: A non-conductor of current
Ion: An electrically charge molecule or atom
Jack: A device with one or more springs, used with a plug for making connection to a telephone receiver or loud speaker
Kennelly-Heaviside Layer: See *Heaviside Layer.*
Lightning Arrester: A device used to prevent lightning from entering a radio receiver
Loop: A large coil used in place of an aerial
Megohm: One million ohms
Microfarad: A unit of capacitance.
Microphone: A device for converting the energy of sound waves into electric current
Modulation: Irregular changes in the amplitude of a wave due to the effect of current from a microphone or similar device
Neutralizing Condenser: Used between successive grid circuits to prevent oscillation.
Neutrodyne: A circuit which employs neutralizing condensers
Ohm: A unit of resistance
Oscillation: A rapid periodic reversal of current
Oscillator: A tube and attached circuits in which direct current is converted into A C by the interaction of the grid and plate circuits
Phase: Time relation between two vibrations, the portion of a vibration already completed.

GLOSSARY OF RADIO TERMS—Continued

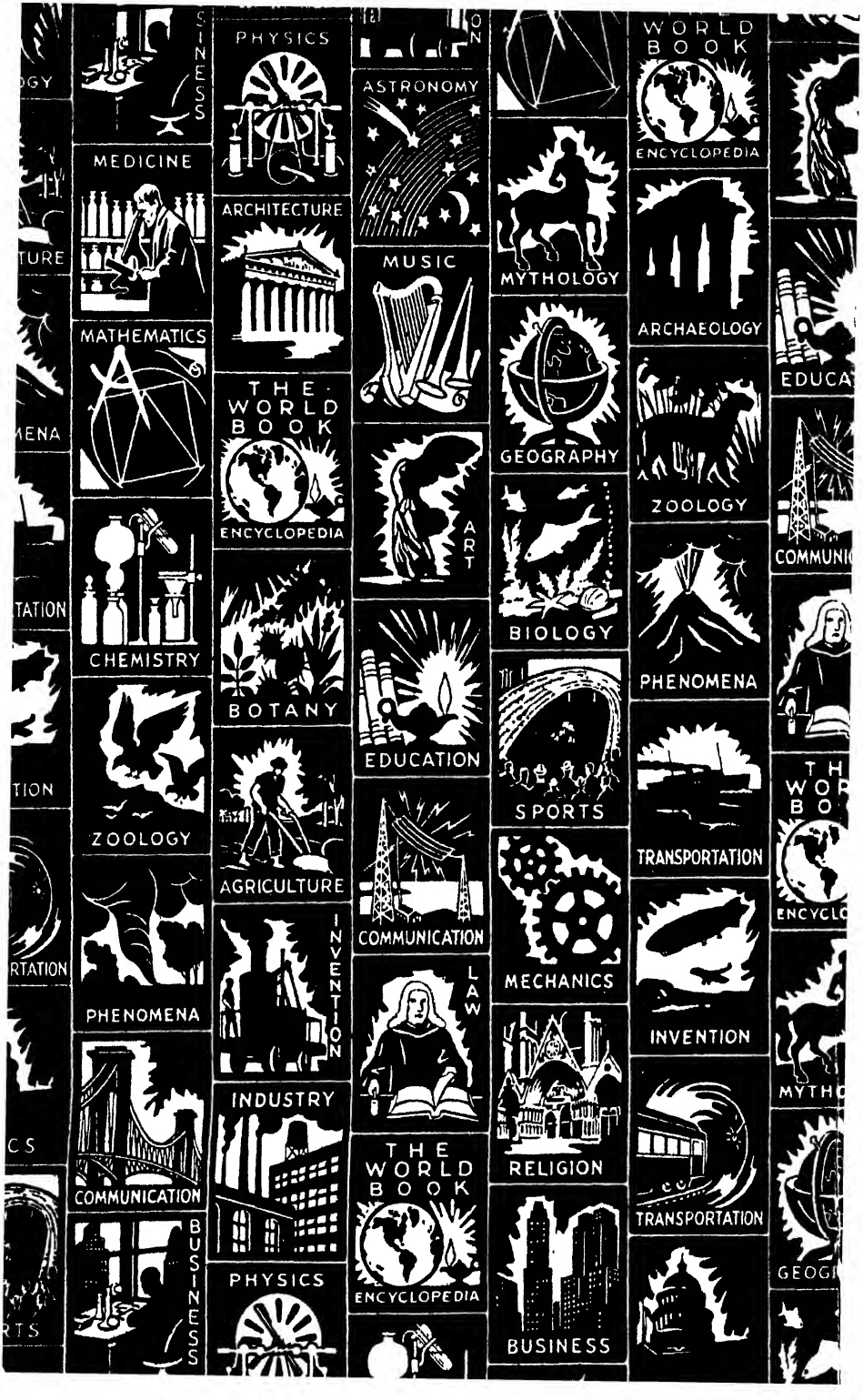
Photocell, or **Photo-Electric Cell:** A tube which allows current to flow through it when it is illuminated.
Pick-up Coil: A coil which absorbs energy from some other circuit.
Plate: The high-potential electrode of a vacuum tube.
Potential: The degree of + or − compared to some standard, measured in volts; the work necessary to move a unit charge from the earth to the given point
Potentiometer: A resistance with its ends at different potential, and a movable contact for obtaining intermediate potentials.
Push-Pull: A type of audio amplifier which uses two tubes in parallel, and two double-winding transformers.
Range of Transmission: The distance at which waves may be detected.
Radiation: Electromagnetic waves.
Radio Frequency: Frequencies above the audible range.
Reactance: Opposition to flow of A.C., due to inductance and capacitance
Reactivation: Renewal of the ability of the filament of a tube to emit electrons A new coating of thorium oxide is formed on the surface of the filament, by baking it out from the interior.
Rectifier: A device for changing A C to D.C.
Reflex: A circuit in which one or more tubes amplify at both radio and audio frequencies
Regeneration: The process of building up a large alternating current in the plate circuit of a vacuum tube by passing some energy back to the grid circuit through coupling
Resistance: Opposition to flow of direct current
Resonance: Two circuits are in resonance when their natural frequency of oscillation is the same
Rheostat: A variable resistance.
Screen Grid: An extra grid between the usual control or signal grid and the plate of a vacuum tube
Secondary: The coil of a transformer in which current is induced
Selectivity: The ability of a receiver to separate signals from two stations whose oscillation frequencies are close together
Shield: A metal box or screen around part of a receiver, to prevent magnetic or electrostatic coupling with other parts.
Shunt: A conductor placed across the terminals of an instrument
Static: Noises in a receiver due to natural electrical disturbances
Superheterodyne: A circuit in which the signal wave is heterodyned by a local oscillator, and the beat-frequency is amplified.
Transformer: Two coils coupled together, so that current in one induces current in the other, by magnetic forces.
Triode: A vacuum tube containing three electrodes
Tuning: Adjusting a circuit to the same natural frequency as electrical impulses.
Undampt (Undamped) Waves: The amplitude remains constant
Vacuum Tube: A tube from which most of the air has been removed, usually refers to a tube used in radio
Variometer: An inductance variable by changing the coupling between two of its parts
Vernier: A slow-motion device used on any variable instrument.
Volt: A unit of electrical potential.
Voltage: Amount of potential in volts.
Watt: A unit of power; equal to $\frac{1}{746}$ horse power
Wave Length: The distance between two consecutive points in the same phase, e.g , from the crest of one wave to the crest of the next
Wave-Train: A group of waves of decreasing amplitude.
Wave Trap: A device for eliminating interfering waves.

RADIO COMPASS. See COMPASS; also RADIO COMMUNICATION.

RADIOLARIA, *ray dih o la' rih ah,* an order of minute one-celled animals found in the warm seas. They belong to the lowest branch of the animal kingdom (see PROTOZOA). Radiolarians have the body covered with a tiny shell of silica. After a radiolarian dies, its shell sinks to the ocean floor, and the accumulations of countless shells have caused the formation of thick layers of ooze in many parts of the sea. Fossil remains of these shells constitute a large part of the rock known as *tripoli,* and of *Barbados earth,* both of which are used as polishing powder. The name of the order has reference to fine threads of protoplasm which, projecting from the cell body through apertures in the shell, radiate in all directions. S.H.S.

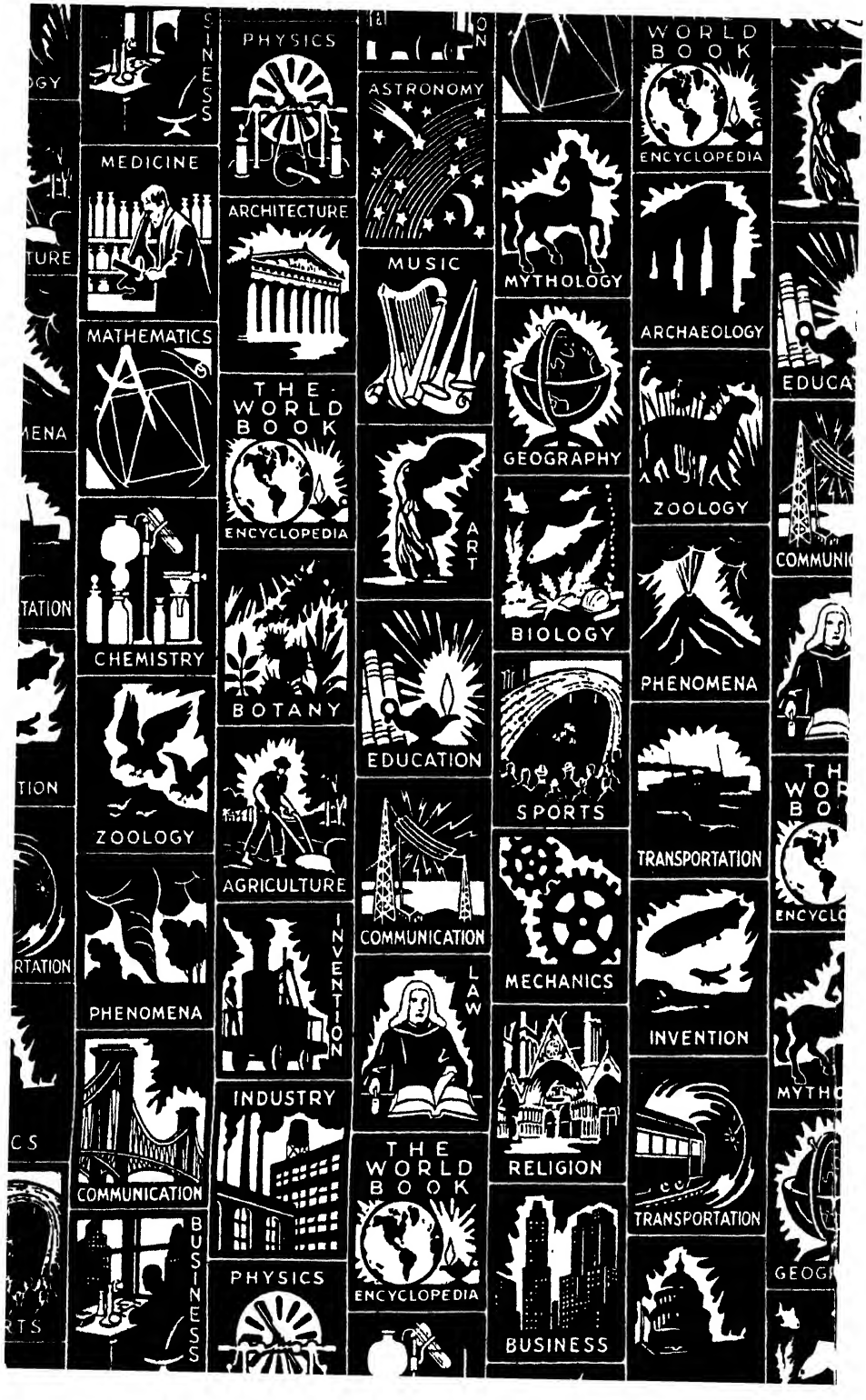
RADIOPHOTOGRAM, *ray dih o fo' toh-gram.* See PHOTOGRAPHY (By Radio and Telephone); RADIO COMMUNICATION.

RADISH, a garden vegetable cultivated for the root, which is eaten raw as a relish or salad. The root is either carrot-shaped or round. The radish is related to the mustard, and above ground looks very much like it, except that the flowers are white instead of yellow. The seeds may be sown in very early spring, if sheltered spots are chosen, in well-prepared rich soil, about an inch below the surface. Radishes should not be allowed to mature closer than one in each two inches of the row, and should be ready to eat about three weeks after planting. Seeds may be planted every two weeks during the spring, which insures crisp, good radishes for table use throughout the season. They have little nutritive value. B.M.D.


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